OPERATING MANAGEMENT'S
OWN MAGAZINE . . .

CHEMICAL PROCESSING®

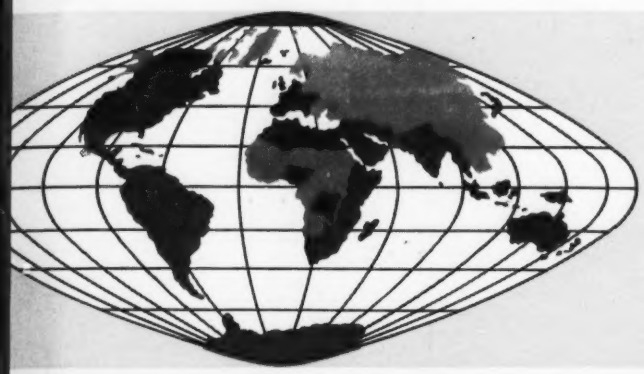
JULY 1961

Chemical Adds Strength To Paper

Dialdehyde starch provides 25-100% improvement in regular production runs 51

Air Pollution Receives KO Blow

Electrostatic precipitator, wet-type scrubbers recover 32 tons of chemicals daily 65

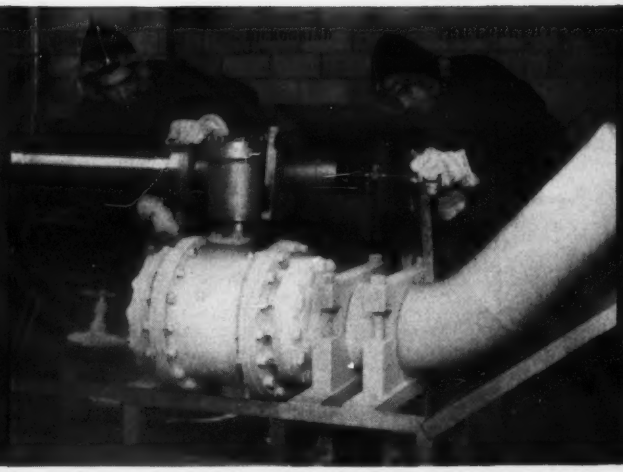


Profile of Progress

HOW JERSEY STANDARD OPERATES ITS FAR-FLUNG NETWORK . . . page 23

INDUSTRIAL CRYOGENICS . . . Part II - 24 more pages.

Six more articles covering insulation, nitrogen, valves, vessels, casting alloy and carbon dioxide . . . page 27



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Aluminum Fluoride, Powder, Reagent
Aluminum Fluoride, Crystal, Tech.
Ammonium Fluoborate, Crystal, Tech.
Ammonium Fluoride, Crystal, Reagent & Crystal, Tech.
Antimony Pentafluoride
Barium Fluoride, Powder, Reagent, & Powder, Tech.
Bismuth Trifluoride

Sodium Fluoride, Powder, Reagent, A.C.S.
Sodium Zirconium Fluoride
Strontium Fluoride
Sulfur Hexafluoride
Tantalum Pentafluoride
Tellurium Hexafluoride
Titanium Tetrafluoride
Tungsten Hexafluoride
Zirconium Tetrafluoride

Potassium Fluoride, Anhy., Purified
Potassium Titanium Fluoride
Potassium Zinc Fluoride
Potassium Zirconium Fluoride
Selenium Hexafluoride
Silicon Tetrafluoride, Gas
Silver Difluoride
Sodium Fluoborate, Crystal, Tech.

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Chromium Potassium Fluoride
Cupric Fluoride, Powder, Tech.
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Fluosulfonic Acid
Hydrofluoric Acid
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conventions and exhibits

July 18-20. Western Plant Maintenance & Engineering Show, Pan Pacific Auditorium, Los Angeles, Calif.

Aug. 3-5. 44th Canadian Chemical Conference and Exhibition, The Chemical Institute of Canada, Queen Elizabeth Hotel, Montreal, Canada.

Aug. 6-12. International Congress on Pure & Applied Chemistry, Montreal, Canada.

Aug. 14-16. Technical Association of the Pulp and Paper Industry, Lignin Symposium, Edgewater Beach Hotel, Chicago, Ill.

Aug. 15-17. Cryogenic Engineering Conference, University of Michigan, Ann Arbor, Mich.

Aug. 15-18. Testing Conference, Technical Association of the Pulp and Paper Industry, Queen Elizabeth Hotel, Montreal, Quebec.

Aug. 28-*Sept.* 1. International Heat Transfer Conference, American Society of Mechanical Engineers, University of Colorado Campus, Boulder, Colo.

Sept. 3-8. American Chemical Society, 140th National Meeting, Chicago, Ill.

Sept. 5-8. 11th National Chemical Exposition, International Amphitheater, Chicago.

Sept. 11-13. Technical Association of the Pulp and Paper Industry, Corrugated Containers Conference, St. Francis Hotel, San Francisco, Calif.

Sept. 11-15. Instrument Society of America, Fall Instrument Automation Conference and Exhibit, Memorial Sports Arena, Los Angeles, Calif.

Sept. 14-17. Drug, Chemical

& Allied Trades Association. Annual Meeting, Pocono Manor Inn, Pocono Manor, Pa.

Sept. 18-19. Chemical Market Research Association, Lake George Sagamore, Bolton Landing, N.Y.

Sept. 19-21. TAPPI and Canadian Pulp Association, 4th International Mechanical Pulping Conference, Edgewater Beach Hotel, Chicago, Ill.

Sept. 24-27. National Power Conference, American Institute of Electrical Engineers and American Society of Mechanical Engineers, St. Francis Hotel, San Francisco, Calif.

Sept. 24-27. American Institute of Chemical Engineers, 45th National Meeting, Lake Placid Club, Lake Placid, N.Y.

Oct. 4-6. National Association of Corrosion Engineers, Western Regional Conference, Benson Hotel, Portland, Ore.

Oct. 9-11. Plastics-Paper Conference, Technical Association of the Pulp and Paper Industry, French Lick-Sheraton Hotel, French Lick, Ind.

Oct. 18-20. 23rd Annual National Packaging Forum, Packaging Institute, Biltmore Hotel, New York City.

Oct. 24-27. National Association of Corrosion Engineers, Conference and Exhibition of 1961, Shamrock Hotel, Houston, Tex.

Oct. 31-*Nov.* 4. Federation of Societies for Paint Technology, 39th Annual Meeting and 26th Paint Industries' Show, Shoreham Hotel, Washington, D.C.

Nov. 27-*Dec.* 1. 28th Exposition of Chemical Industries, Coliseum, New York City, New York.

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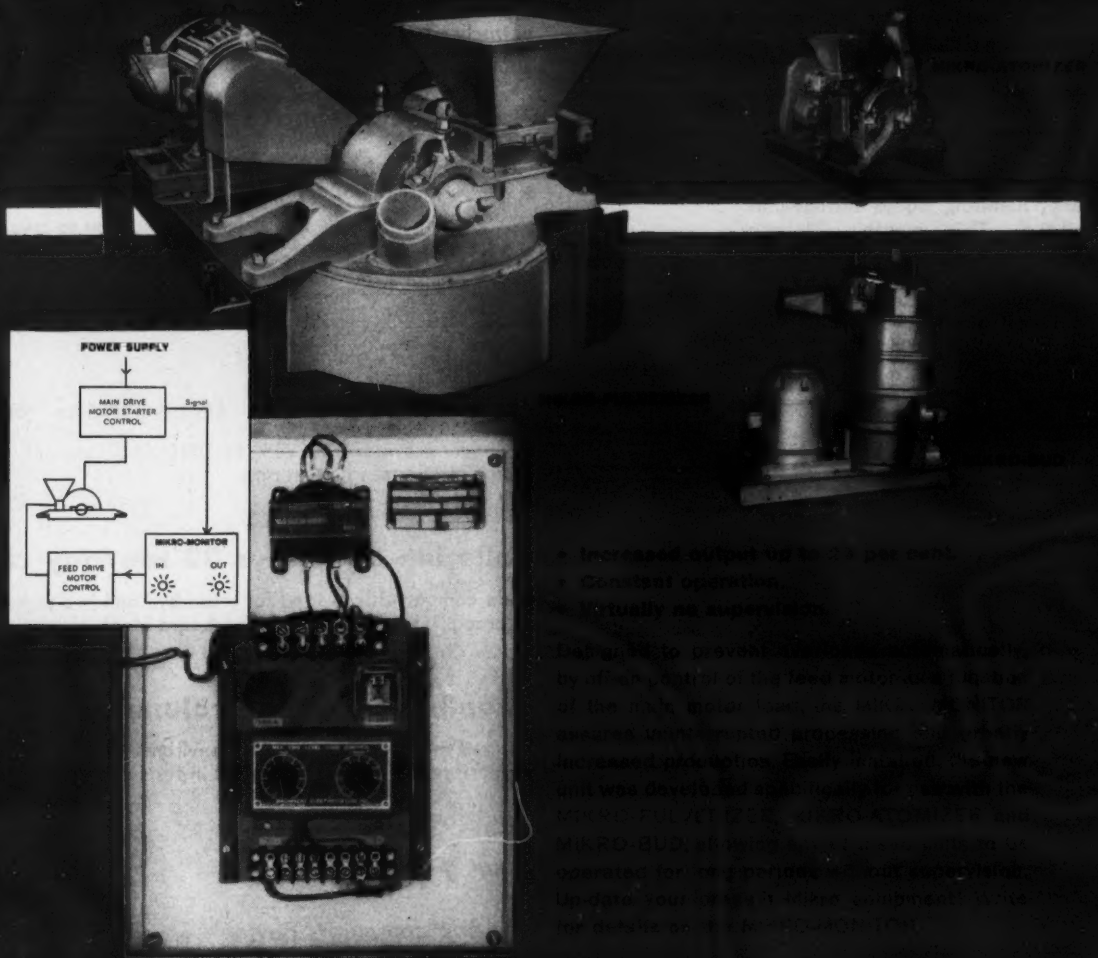

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SPAN THE GLOBE

Check 4745 opposite last page.

CHEMICAL PROCESSING HIGHLIGHTS

JULY 1961

VOLUME 24 • NUMBER 7

THIS MONTH'S COVER

Three individual features appearing in this issue are illustrated on the cover. Map at the top shows the world-wide scope of Jersey Standard's chemical operations. See company profile story, page 23. Photograph in center is of a 10" cryogenic ball valve, made by Koehler Aircraft Products Company, handling liquid nitrogen at −320°F. This month's 24-page feature on cryogenics starts on page 27. Drawing at bottom illustrates how titanium sieve plates in a column cut corrosion and erosion at Union Carbide. See article page 92.

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114 Here's why you must watch your step with Hg cells

over the editor's shoulder

Equipment makers or consulting firms?

Today, many chemical companies receive free of charge from their process-equipment suppliers a number of engineering services not directly connected with the design and installation of equipment being purchased. (In fact, in some cases they obtain such engineering along with a bid and end up not even buying the equipment, but fabricating it themselves or having it done by a small shop.)

The newly formed Process Equipment Manufacturers Association's proposed answer to this "free-engineering" problem is to charge for these services. (See "Changes loom in industry which supplies your processing equipment," May 1961 CHEMICAL PROCESSING, p. 38.)

In this corner's opinion, such an approach would be a mistake. It would turn equipment makers into engineering consultants. They would thus put themselves in direct competition with chemical-plant engineers and consulting firms. In the face of this competition, some small manufacturers might well fall by the wayside.

A better solution would be for the equipment manufacturers not to give extra engineering services at all. If this were to be done, bids would consist primarily of price information with only sketchy outlines on the physical set-ups. (This would probably necessitate even stronger guarantees than are now the practice.)

An approach along these lines would place prime responsibility for non-equipment-oriented design back where it belongs . . . in the hands of the chemical-company engineers (or consultants which these firms might hire.)

The suppliers could then concentrate all of their dollars and considerable talents on their original prime function—design and manufacture of outstanding process equipment.

George Bangs

George Bangs,
Assistant Editor

"Made OF Stainless Steel ...Made BY Jenkins"

And the "BY" is the most important word in that Spec!

Let's talk sense about stainless steel valves.

The material, the metal itself, is pretty much a cut-and-dried matter of *specifications* — selecting the right metal for a particular application. After all, the same alloys are available to *all* valve manufacturers!

But —

Just as is the case with iron or bronze valves, the basic and essential difference is in the *way* valves are made. *Perfection of castings . . . precision machining . . . sound design . . . painstaking inspection and testing —*

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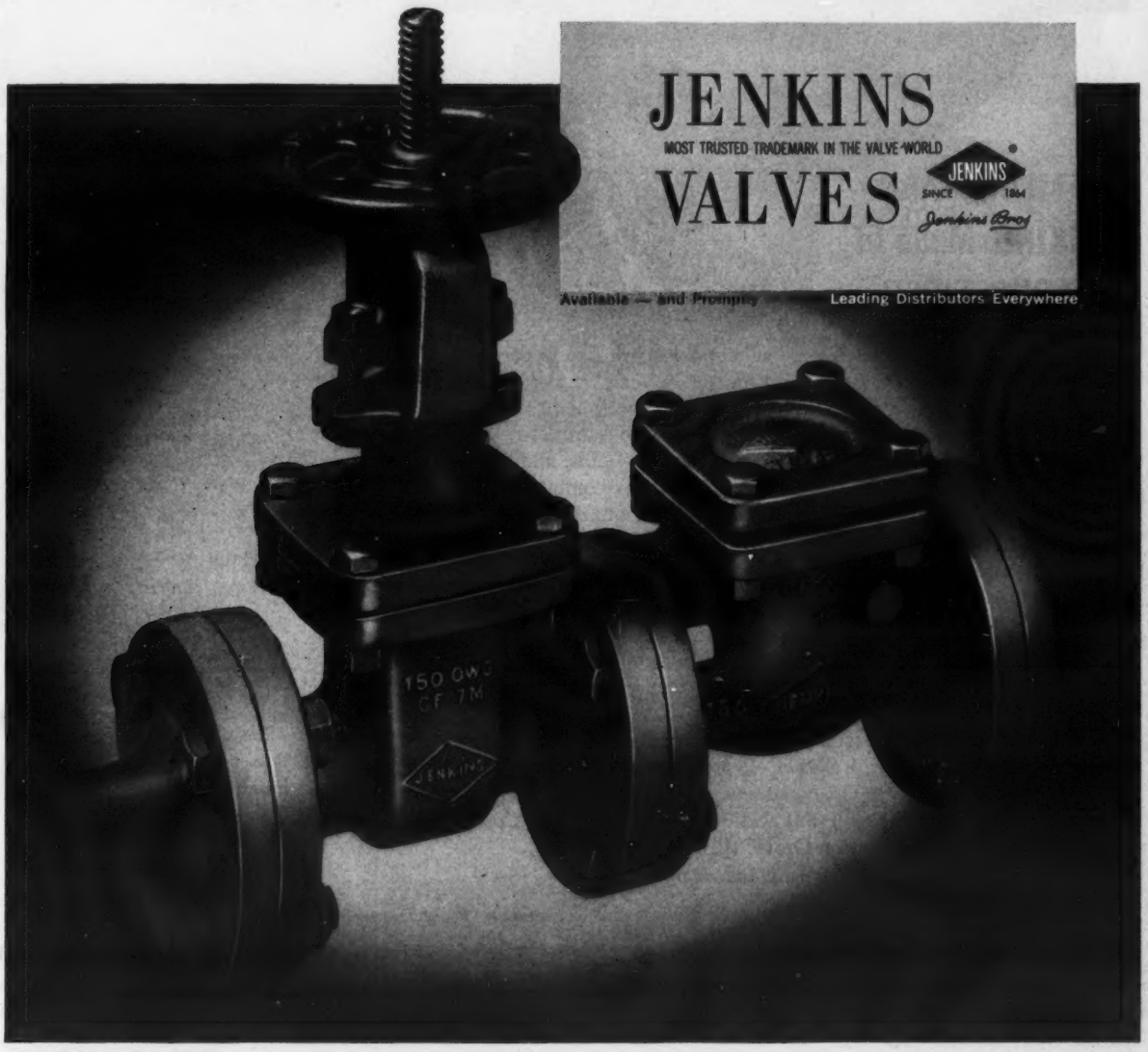

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Here's How to Handle Corrosives at High Peripheral Speeds

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Chemlon Multi-Filament Yarn Packing gives you two important advantages not provided by other types of braided or molded Teflon packing: (1) positive sealing efficiency at high peripheral speeds; (2) a cooler running stuffing box under severe service conditions.

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In Canada: Crane Packing Company, Ltd., Hamilton, Ont.

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Check 4747 opposite last page.

CHEMICAL PROCESSING

JULY 1961
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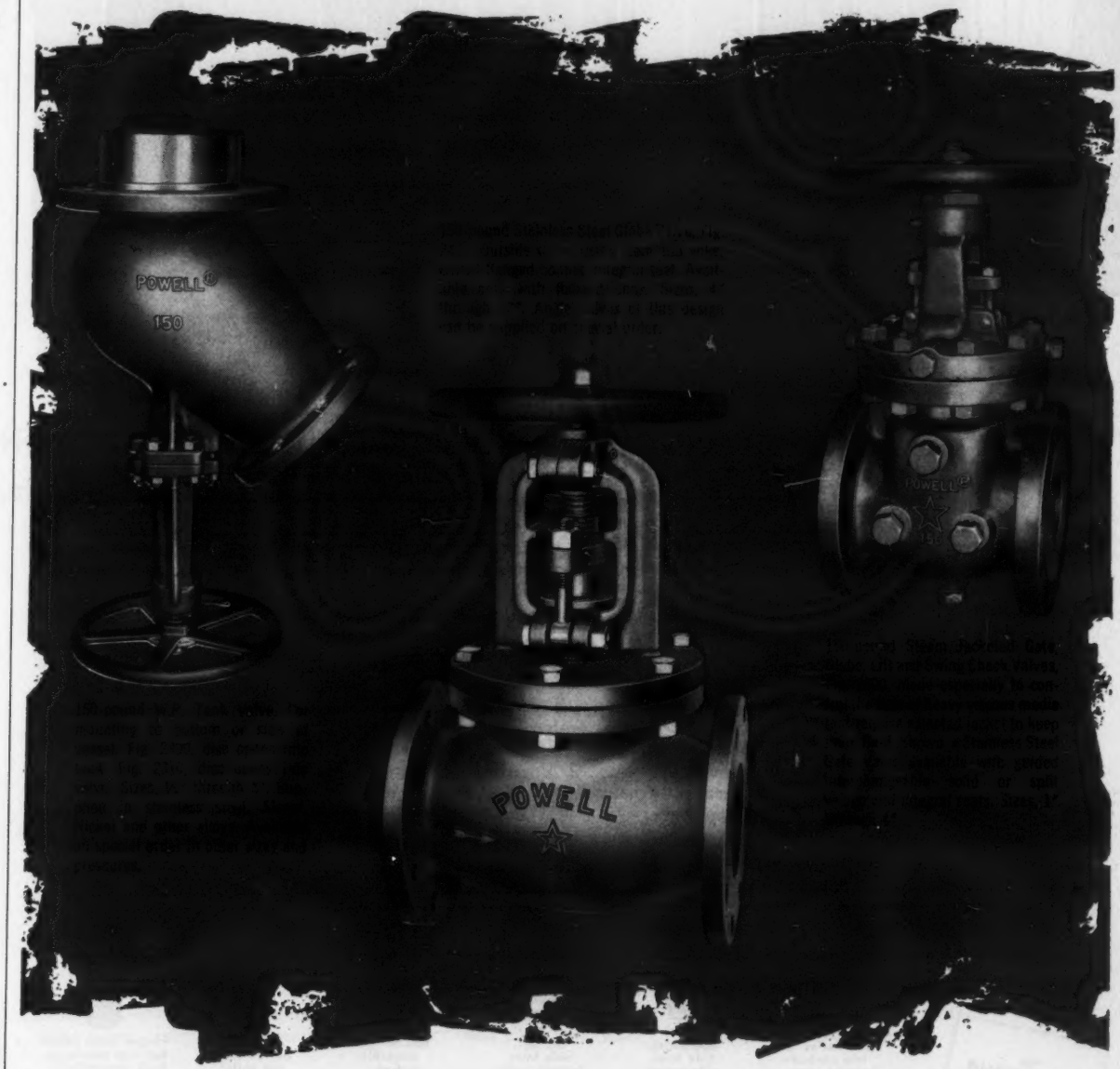

115th year of manufacturing industrial valves for the free world

POWELL CORROSION RESISTANT **VALVES**

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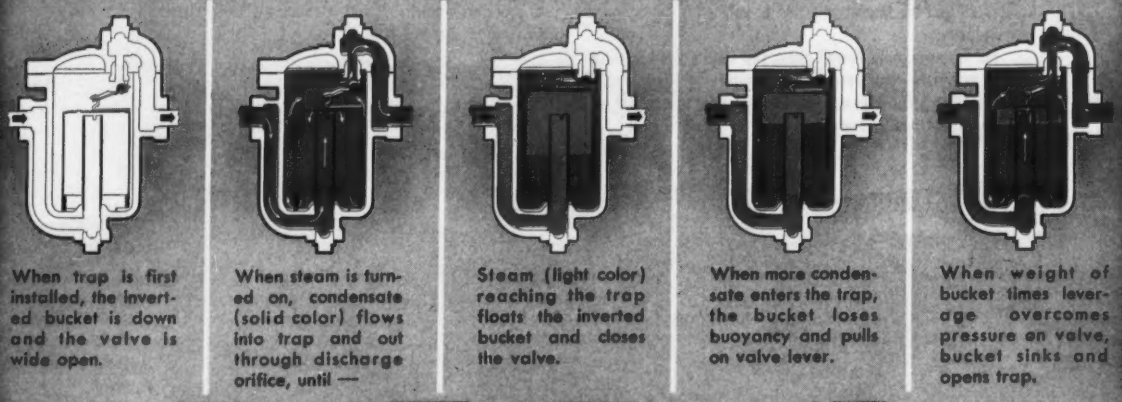
This simple trap operating principle provides the efficiency, dependability and freedom from maintenance necessary for the most profitable use of steam


When trap is first installed, the inverted bucket is down and the valve is wide open.
When steam is turned on, condensate (solid color) flows into trap and out through discharge orifice, until —
Steam (light color) reaching the trap floats the inverted bucket and closes the valve.
When more condensate enters the trap, the bucket loses buoyancy and pulls on valve lever.
When weight of bucket times leverage overcomes pressure on valve, bucket sinks and opens trap.
Key: condensate steam steam bubbles air bubbles

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are designed and made to give you these big benefits:

● Amstrong Traps, the first inverted bucket steam traps, now represent the most advanced development of this time-proven principle. They provide all the advantages necessary for efficient, economical condensate drainage from virtually all types of steam using equipment.

1. *No steam loss* – Steam never reaches the orifice even when there is no condensate load.
2. *Automatic air elimination* – Vent in trap bucket passes air and other non-condensibles through to be discharged with condensate.
3. *No cooling leg required* – Condensate is discharged at steam temperature as fast as it reaches the trap because trap operates on difference in density between steam and water not on temperature.
4. *Operates on any back pressure* – Failure of one trap in system will not cause others to open because high back pressure does not affect an Armstrong trap other than to reduce capacity. As long as there is a pressure differential across the orifice the trap will close on steam and open for condensate.
5. *Unaffected by ordinary dirt* – Swirling action of condensate keeps dirt in suspension until discharged with condensate, prevents it from lodging in valve.
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7. *Big capacity in a small, economical package* – Armstrong design gives you the highest practical capacity for any given pressure. And remember, Armstrong capacity ratings are based on *hot* condensate at the *working pressure differential* stated, not on theoretical orifice capacities.

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The 48 page Armstrong Steam Trap Book tells how to correctly size, install and maintain steam traps for any pressure, any temperature, any load plus full catalog data on Armstrong Steam Traps. Ask for Catalog K.

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CHEM-TRENDS / Our Growing Industry

Name changes catch up with changing identities of CPI companies

Food Machinery and Chemical Corporation is the latest chemical company to decide that the nature of its business interests and the image generated by its name are incompatible.

As a result, effective July 1, Food machinery will start calling itself FMC Corporation, a name many in the industry have been using informally for some years now. FMC traces its genealogy back to Bean Spray Pump Company, later John Bean Manufacturing Company. Change to Food Machinery Corporation occurred in 1929. The company added "and Chemical" in 1948.

Sales of "food machinery" account for less than one-fourth of FMC's total business volume.

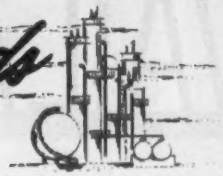
Atlas Chemical Industries, Inc. (nee Atlas Powder Company) has completed absorption of The Stuart Company, ethical pharmaceutical manufacturer, into its corporation operations. Stuart becomes Atlas' fourth operating division. Effective with merger is a stock split — four shares of Atlas Chemical Industries, Inc. for each share of Atlas Powder.

Chemtron Corporation, producer of aluminum chloride, zinc chloride, chlorinated paraffin waxes, copper sulfate and ferric chloride, became **Pearsall Chemical Corporation** effective June 1. According to Mason Pearsall, president, change will eliminate confusion with other names in chemical field; permit company to develop new trade mark, better identification.

While not changing its name,

To page 10

Chem-trends



Authorities say . . .

We must speed up training, Do something about obsolesence

"We can no longer wait so long before beginning specialized training of our gifted youth," creative organic research medalist Dr. M. S. Newman, of Ohio, told Synthetic Organic Chemical Manufacturers in NYC. "Start foreign language training in kindergarten. Take teeners into your labs to do serious summer work under professional researchers . . . . if special insurance is required, buy it! Only by such local actions are we going to get the numbers of inspired, able people already needed."

At the Massachusetts Institute of Technology centennial in Cambridge, Mass., 100 scholars recently wrestled with similar problems. One of their few pronouncements had to do with human obsolesence. MIT Prof. E. E. Morison said that a group under his leadership was appalled at the accelerated pace of change and the vastly increasing quantity of scientific knowledge. To try better to keep up the developments in one's own field, the group suggested it should be possible for men and women to return to school at intervals of five years for periods of five weeks throughout their lives. ■

Search for executive talent narrows as employers insist on "types"

Hunting for specialized, often high-priced men who can "do the job" is a big business. Some employers pay retainers to keep the hunters on the trail of the hunted. But it is not the quarry that is elusive, report some of the biggest operators. It is the insistance of so many employers on judging only by what a prospective employee has done, not on the basis of what he is capable of doing according to the man's more fundamental characteristics and learning potential.

"It is almost as if we are asked to deliver a highly-successful stereotype at which everyone will marvel as to how an employee was persuaded to leave his secure, rewarding post," complains a veteran searcher.

Prediction: Greater reliance on evaluation procedures handled by human developers. ■

International Japanese labor costs have begun spiraling upward as revealed by an average 12.4% increase being granted government workers. Private industry labor unions won a big raise averaging $8.30 a month. Whether this may be partially offset by smaller increases in bi-annual bonuses remains to be seen, but as these are determined by negotiation, chances are good that labor may get bonus benefits as well.

Another common market has come into being — this time, Latin America. Taking at least six months to get under way, Argentina, Brazil, Chile, Peru, Paraguay, Uruguay and Mexico will participate. Expect it to supply needed purpose and initiative. ■

Processing — Celanese is spending $27 million for expansion and modernization this year; Mobil Chemical, $70 million. Olin's earmarked sum will reach $40-60 million.

Venturi-type air scrubbers will be used to reduce further dust emission from Colorado Fuel & Iron's Boulder blast furnaces.

More pooling of efforts toward development of completely automatic control systems is seen in "agreement of mutual support" by Allis-Chalmers, Consolidated Systems Corp., and IBM. Firms will work together when it is in the best interest of the customer; each can work with others.

Trend towards outdoor plants is rough on exposed insulation, says Union Carbide, in advocating stainless steel jacketing on basis of extensive S. Charleston tests. Color coding is by joint-enclosing bands.

Expect car engines to reach compression ratios of 300 to one, a computer study tells automobile makers. Now fuels will have to be created.

Crankcase blowby gases — which may account for up to one-third of total hydrocarbon emission from car engines — may be piped into carburetor intakes of New York State licensed vehicles, if request to manufacturers by the City's Commissioner of Pollution control is heeded. The added cost would be $5 a car.

First flow (500,000 gals) of demineralized seawater from one of the Government's eight planned plants recently entered Freeport, Tex., mains.

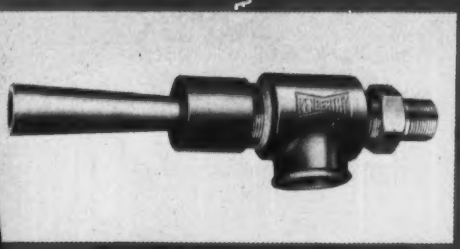
Burning solid rocket fuels in a rocket housed in a vacuum chamber is the latest environmental simulation twist; it is operating at Esso R&E.

Saturn missile's first stage booster engine cluster uses about seven railroad tank cars, equivalent of liquid oxygen during each test-firing at Marshall Development Center, Huntsville, Ala.

Increase of one-fourth in nuclear electric power output at no extra fuel cost, by changes increasing heat output of reactors, is reported by the British at two stations.

Federal support for scientific R&D for '61 — an estimated $9.1 billion — is up 0.5 over '60. About 5% of all State Government employees are scientists and engineers, the National Science Foundation reports, with California leading at 5310.

AVAILABILITY



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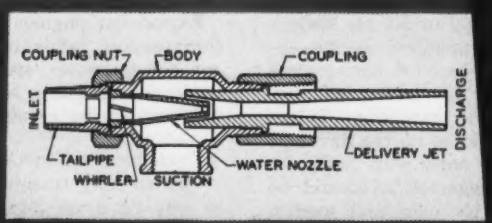
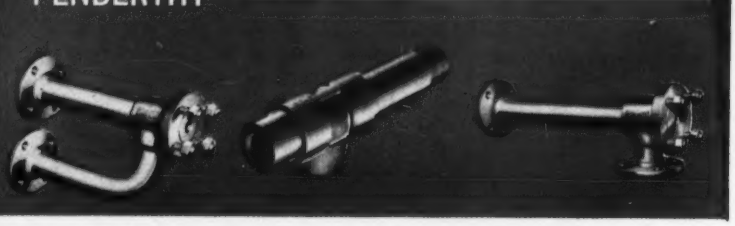




When you want something . . . like a jet pump, for example . . . you *want* it. Not day after tomorrow, or next week, but *now!* Right? And that's just one more advantage of Jet Pumps by Penberthy. Availability . . . *now*.

Penberthy, to begin with, has a broader line with more models and sizes to offer . . . hydraulic, air or steam operated . . . in bronze, iron, stainless steel, monel, plastic and other materials. Penberthy, in addition, offers "standards" on many designs that would be labeled "special" by other manufacturers.

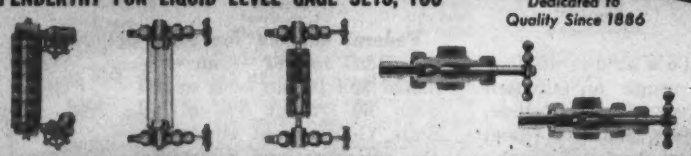
Add to the above, Penberthy's nationwide network of representatives and stocking distributors. They're located in all the major metropolitan areas so, chances are, there's a Penberthy man near you. Be happy to supply his name and address . . . write or cali the Penberthy sales office at the address below . . .

PENBERTHY MANUFACTURING COMPANY
Division of Buffalo-Eclipse Corporation
PROPHETSTOWN, ILLINOIS
SALES OFFICE: 2660 E. GRAND BLVD., DETROIT 11, MICH.

PENBERTHY

Dedicated to Quality Since 1886

PENBERTHY FOR LIQUID LEVEL GAGE SETS, TOO



WRITE OR CALL PENBERTHY TODAY FOR COMPLETE INFORMATION

Check 4750 opposite last page.

OUR GROWING INDUSTRY

From page 8

McKesson & Robbins, Inc. has adopted new trademark and logotype to emphasize its image as distribution specialists in chemicals, drugs and liquor. Trademark is an abstract of concentric arrows preceding the name.

Shareholders of **Diamond Alkali Company** and **Chemical Process Company** will vote at separate meetings Aug. 15 on proposals to merge CP into Diamond. Diamond shareholders also will vote on proposed merger with The Bessemer Limestone and Cement Company. Diamond would trade one share of new $4 preferred stock for each three shares outstanding of Bessemer common; and one share of the same preferred for each 8-1/3 shares of Chemical Process common stock outstanding.

National Starch and Chemical Corporation has purchased business and assets of Kleen-Stik Products, Inc., producer of pressure-sensitive labelling papers, foils and films. Kleen-Stik will be operated as subsidiary.

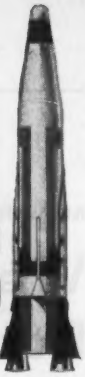
Nopco Chemical Company has swapped 30,000 shares of its common stock to acquire six midwest foam companies from D & W Clark Corporation of Chicago. Companies to be operated by Nopco as subsidiaries are: Clark Foam Products Co., Inc. (Illinois); Clark Products, Inc. (Indiana); Clark Products, Inc. (Nebraska); Clark Foam Rubber & Fabrics, Inc. (Colorado); Clark Foam Rubber, Inc. (Minnesota); and Clark Fibre Products, Inc. (Illinois).

Thiokol Chemical Corporation is trading 2850 shares of its common stock for between 85 and 95% of outstanding voting stock of Shawnee Industries, Inc. Shawnee was formed early this year to acquire Jonco Aircraft Corporation in Shawnee, Okla.

Humble Pipe Line Company, which moves 600,000 bbl/day of crude oil and petroleum products through

To page 12

RYAN CRYOGENIC SPECIALISTS FOR INDUSTRY-MILITARY



RYAN offers *custom & production* Cryogenic Equipment to handle liquid oxygen, hydrogen, nitrogen, helium, and argon.

RYAN'S Design Engineering Capability • Quality and Cost Control Manufacturing Procedures • furnish a complete line from 30 gallon portable units to large liquefied gas storage stations. Included are either ambient, electrical or steam vaporizers with capacities meeting customer's requirements.

You can also *Rely on Ryan* for maximum carrying capacity semi-trailers and other over-the-road Cryogenic Equipment.

RYAN
INDUSTRIES, INC.
Cryogenic Division, Dept. M
888 East 70th Street, Cleveland 3, Ohio
Write Today for Technical Literature

Check 4751 opposite last page.

THAT'S INTERESTING

Computer is tutor

A teaching machine system, being developed by the University of Illinois, uses the Illiac computer for brainpower. It has been described as an electronic blackboard and textbook with a talent for prompting.

At present, it is programmed for teaching math and French grammer, but one goal is to program it to teach students how to program computers.

Radiation checks err

A check-up on 76 agencies who monitor the amount of radioactivity in the water, showed that they were under-estimating amount of radioactivity actually present.

Only about 50% were able to detect total radioactivity within 10 to 15% of true amount in water samples containing predetermined amounts.

For more information on product at right, specify 4752 see information request blank opposite last page.

AMMONIUM NITRATE C&I

new prilling process

C&I ammonium nitrate plants equipped with prill towers approximately ⅓ the size of conventional towers produce a superior prilled ammonium nitrate fertilizer from an almost anhydrous melt. Because of its physical characteristics, this product can be stored and shipped in bulk. These plants can also be designed to produce any of the nitrogen solutions offered on the market today.

THE CHEMICAL AND INDUSTRIAL CORP.

CINCINNATI 26, OHIO

For more information on this proven C&I process, write today for a new brochure which contains comprehensive data and flow sheets.

Uniform polyvinyl chloride coating over thin liner offers longer service and superior protection against oil, grease, most acids, solvents and other chemicals. Coating is flame resistant and nonoxidizing, will not crack or peel, is extremely flexible. Thin liner absorbs less water, permits easier laundering. Gloves are shaped and sized to fit the hand, thus providing greater dexterity, more comfort. Write for complete information and literature.

To keep workers dry and comfortable in foul weather and to give them superior protection against chemicals, oils and greases—insist on North PVC Protective Clothing.

WRITE TODAY FOR LITERATURE DESCRIBING THESE PROTECTIVE PRODUCTS BY JOMAC

JOMAC Jomac Inc., Dept. N
Philadelphia 38, Pa.

In Canada: James North Canada Company Ltd., Simcoe, Ont.

"Jomac Sells Quality . . . and Quality Sells Jomac!"

Check 4753 opposite last page.

OUR GROWING INDUSTRY

From page 10

9500-mile system, and **Interstate Oil Pipe Line Company,** which has 3000 mi of pipe and 470,000-bbl/day throughput, are planning to merge. Humble Pipe Line is wholly-owned affiliate of Humble Oil & Refining Company — prospective owner of all stock in resultant company — while Interstate is owned by Standard Oil Company (N.J.). Humble Oil, in turn, is principal operating affiliate of Standard (N.J.).

Krystall Chemical Company, Chicago-based surfactant producer, has been acquired by **The Richardson Company** — third chemical acquisition in two years for Richardson.

To meet growing demands of detergent and urethane markets, **Wyandotte Chemicals Corporation's** Michigan Alkali Division will build $3.5-million propylene oxide plant on 23-acre waterfront site at Wyandotte, Mich.

Diammonium phosphate will be added to **International Minerals & Chemical Corporation's** line of fertilizer ingredients this year when $3.8-million expansion project at Bonnie, Fla., phosphate chemicals plant is completed. Addition will produce 100,000 ton/yr of nitrogenous product.

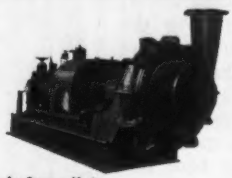
Lasco Industries, producer of fiberglass building panels and plastic pipe, is organizing chemical division to produce intermediates used in paints, chemicals and plastics. Henry C. Nelson will manage new enterprise.

Development of $30-million potash project in Utah is expected to increase **Texas Gulf Sulphur Company** earnings by $5 million annually, President Claude O. Stephens predicts. Potash operations are expected to start enhancing Texas Gulf income early in 1963.

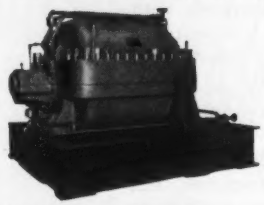
Simultaneously with the dedication of 35-million-lb/yr oxo alcohol plant at Philadelphia, **Gulf Oil Corporation** announced plans for constructing multi-million-dollar benzene-

Why Ingersoll-Rand can supply EXACTLY WHAT YOU WANT in a Centrifugal Compressor

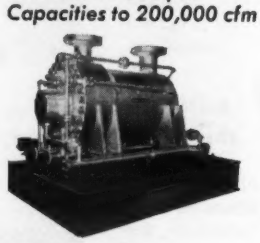
MORE TYPES AND SIZES to choose from



Single-Stage Units
Pressures to 1000 psi
Capacities to 700,000 cfm



Multi-Stage, Horizontally Split
Pressures to 800 psi
Capacities to 200,000 cfm



Multi-Stage, Vertically Split
Pressures to 5500 psi
Capacities to 20,000 cfm

Intercooled 100-psi Units

These four basic casing types can be combined into multiple-unit installations to meet any pressure and capacity requirement. And every design features . . .

GREATER ADAPTABILITY to meet your specific needs. Seals, cooling methods and side-load connections are just a few of the many design details that can be "tailored" to each installation. What's more, every compressor is backed by . . .

MORE THOROUGH TESTING in the world's largest and best-equipped compressor test facility. Here new centrifugal designs, components, accessories and complete machines can be tested, frequently at full load and under simulated operating conditions.

5 MILLION HORSEPOWER of I-R centrifugal compressors are serving all types of applications throughout industry. 263A12

Ingersoll-Rand 11 Broadway, New York 4, N.Y.

Check 4754 opposite last page.

Adding new dimensions *to engineering*

Behind this door...

gamma- and X-rays stop centrifugal compressor problems before they start

We inspect centrifugal compressors *from the inside-out* at our new Non-Destructive Testing Laboratory. Using cobalt 60, iridium 192 or 160-KV X-ray equipment, we look all the way through centrifugal compressor parts to be certain they are free from defects. This extra care in manufacture means extra dependability in the field. It's another reason why users of Ingersoll-Rand centrifugal compressors can expect...and get...more reliable, trouble-free operation.

Controlled from a remote station...gamma rays probe deep...to provide visible internal inspection

At one of 3 test stations, an Ingersoll-Rand radiographer uses remote controls to place radioactive pellets of iridium or cobalt in the exposed position...

...within the thick concrete test cell. The gamma rays penetrate the compressor part and expose the film. The radioactive pellet is then returned to its shielded container.

The developed radiographic view is carefully inspected by I-R metallurgists to be certain that the part is free from defects. Radiography is one of many non-destructive testing methods used by Ingersoll-Rand.

THE WORLD'S MOST COMPREHENSIVE COMPRESSOR EXPERIENCE

Ingersoll-Rand®

260A12 11 Broadway, New York 4, N.Y.

Check 4755 opposite last page.

cumene complex, also at Philadelphia.

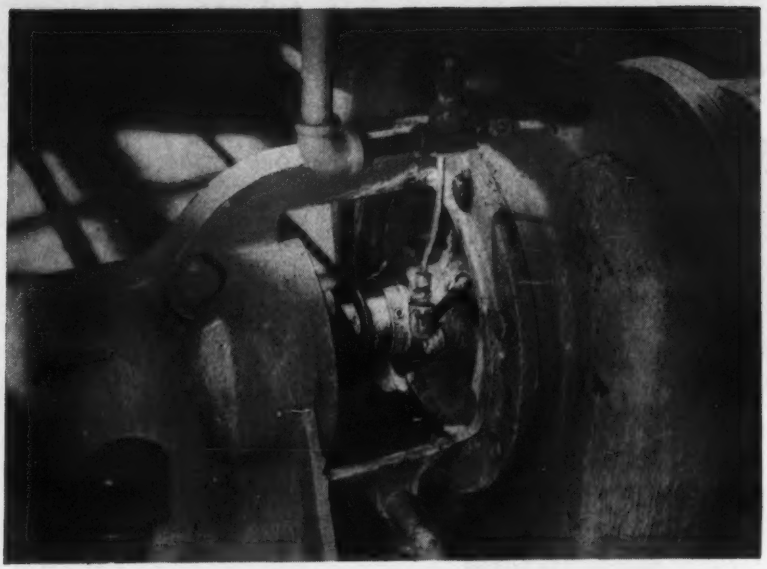
Olin Mathieson Chemical Corporation expects capital expenditures for 1959-63 to total $250 million, according to Stanley de J. Osborne, president.

United Engineers & Constructors, Inc. will engineer and supervise construction of vinyl chloride plant, utilities and off-site facilities which — with acetylene and oxygen plants — will comprise main complex for **Monochem, Inc.** at Geismar, La. Monochem is jointly owned by **Borden Company** and **United States Rubber Co.** When completed in 1962, Monochem will have initial capacity of 150 million lb/yr of vinyl chloride monomer and 80 million lb/yr of acetylene. United Engineers will also construct methanol and vinyl acetate plants and engineer and construct off-site facilities in satellite plant for Borden Chemical Company, division of the Borden Co.

W. R. Grace & Co. is bidding for share of $300-million market created by California's requirement that automobile exhausts be equipped with smog-control devices. Grace's Davison Chemical Division has filed application with California Motor Vehicle Pollution Control Board for testing of device. Grace developed catalyst for use in reactor-muffler which replaces conventional muffler.

Mobay Chemical Company plans to spend $1.5 million to add 10 million lb/yr to its tolylene diisocyanate capacity at New Martinsville, W. Va. This coupled with completion of expansion project there last month which boosted capacity nearly two-thirds, would give Mobay 50-million-lb/yr potential.

Ansul Chemical Company and **Continental Oil Company** are joining forces to construct 60-million-lb/yr methyl chloride plant at Lake Charles, La. Plant, expected to cost over $1 million, is to be completed early next year. ■



CHEMPRO MECHANICAL SEAL "HOLDS THE LINE" AGAINST 560,000,000 GALLONS OF ORANGE JUICE CONCENTRATE

In September, 1956, CHEMPRO MECHANICAL SEALS *were installed in 4 Allis-Chalmers high speed pumps located at the Minute Maid processing plant in Leesburg, Florida. The pumps recirculate orange juice through evaporators used to produce frozen orange concentrate.

So far, each pump and SEAL has handled approximately 560,000,000 **gallons of concentrate. This service is so tough that most other previously used packings and seals needed frequent replacement. The original CHEMPRO MECHANICAL SEALS are still in operation *and there has been no leakage whatsoever in any of the pumps.*

* CHEMPRO MECHANICAL SEAL, Size 250 WLC, quenched, 316 stainless steel with Carbon vs. Ceramic Seal Faces.

** Pump handles 2,000 gal. of concentrate per minute and runs 24 hours per day, 7 days per week, for 7 to 8 months each year.

For information on CHEMPRO MECHANICAL SEALS IN TOUGH SERVICE, WRITE FOR BULLETINS CP-551 and 575.

CHEMICAL & POWER PRODUCTS, INC.

The Original Fabricators of Teflon Packings and Gaskets

9 Broadway, New York 4, N. Y.

Check 4756 opposite last page.

Spotlight On People

Three general managers named by new Cyanamid president

Three of **American Cyanamid Company's** major operating divisions will have new general managers July 1, as a result of appointments announced by **Kenneth H. Klipstein,** recently-elected president.

Appointees are: **Dr. Robert P. Parker,** Lederle Laboratories Division; **Thomas P. Turchan,** Organic Chemicals Division; and **Jerrold H. Ruskin,** Industrial Chemicals Division.

Assistant general manager since 1958, Dr. Parker succeeds **Lyman C. Duncan,** who continues as operating vice president for Lederle and Surgical Products Division. Turchan, formerly Industrial Chemicals manager, succeeds **Neil B. Conley,** who joins Klipstein's executive staff. Ruskin has been president of Arizona Chemical Company, joint venture of Cyanamid and International Paper Company, since 1958.

Lincoln L. Redshaw has been named president of U B S Chemical Company, division of A.E. Staley Manufacturing Co., succeeding Paul W. Atwood, retired.

A top-level reorganization at General Mills gives revised assignments, effective June 1, to **E. W. Rawlings,** and **Delbert F. Wright. Rawlings,** formerly executive vice president in charge of consumer foods, mechanical and chemical activities and finance, is now executive vice president, operations and finance. He reports to President C. H. Bell on operations of Chemical Division, Feed Division, Grocery Products Division, Electronics Group, Specialty Products Division, Sperry (West Coast) Operations, General Mills Limited (England) and newly formed Refrigerated Foods Division. Employee relations, purchasing, traffic, treasurer's and commercial development departments are responsibilities of Wright, whose title has been changed from vice president—employee relations and controller to vice president—administration and employee relations.

Joseph F. Knight moves up from manager of operations for Kaiser Refractories Division of Kaiser Aluminum & Chemical Corporation, to vice president—operations for the division. He is responsible for operations of nine domestic plants.

Director of chemical laboratories for 12 years, **Dr. John N. Street** has been named vice president—research, The Firestone Tire & Rubber Company.

Dr. Edward L. Carr is now manager of research and development for Firestone subsidiary, Firestone Synthetic Rubber & Latex Company.

Sales, purchasing and distribution and traffic functions of The Dow Chemical Company have been integrated administratively with assignment of these responsibilities to **Donald K. Ballman,** named vice president for marketing, purchasing and distribution Ballman has appointed **W. R. Dixon,** director of sales, **G.J. Williams,** general sales manager, and **Oliver E. Beutel,** director of distribution and traffic. **David C. Baird,** recently appointed director of purchases, also reports to Ballman.

Dr. Maurice J. Kelley is now director of research laboratories for The Diversey Corporation.

Norman C. Riley, has been elected to board of National Starch and Chemical Co. (Canada) and **Gerald W. Burgoyne** has been named assist-

To page 16

THAT'S INTERESTING

Specialized cow is next

By controlling diet, a cow might be made to produce milk specifically designed for special-purpose use, such as making cheese or ice cream, scientists believe.

Milk best suited for making cheese may differ in composition from that best suited for ice cream. Diet affects type of bacteria grown in cow's stomach. The type of bacteria present influence type of milk produced.

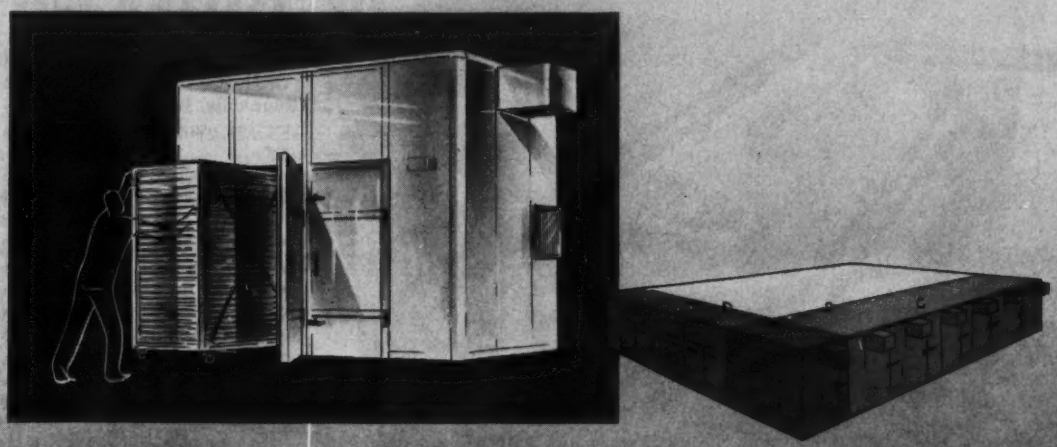
Heat home for $5 yr

Supplementary oil heat for a 3-bedroom solar-heated home in Washington, D.C., costs $5 annually.

Just completed is a two-bedroom solar-heated home for which auxiliary electric heating is expected to cost $20-35 yr. However, use of electricity saves cost of chimney.

For more information on product at right, specify 4757 see information request blank opposite last page.

THIS IS "NATIONAL"...



TRUCK TRAY DRYER. Can be designed for any number of trucks. Style of trucks and trays (or poles) determined by nature of material and other conditions.

"ADD-A-UNIT" CONSTRUCTION. This unique projection provides both simplification of initial installation and/or maximum adaptability to future expansion. Illustration above shows (A) Standard Unit, with duplicate units arranged to provide (B) Multiple-Unit Batch Dryer; (C) Tunnel Dryer; and (D) Multiple Tunnel Dryer.

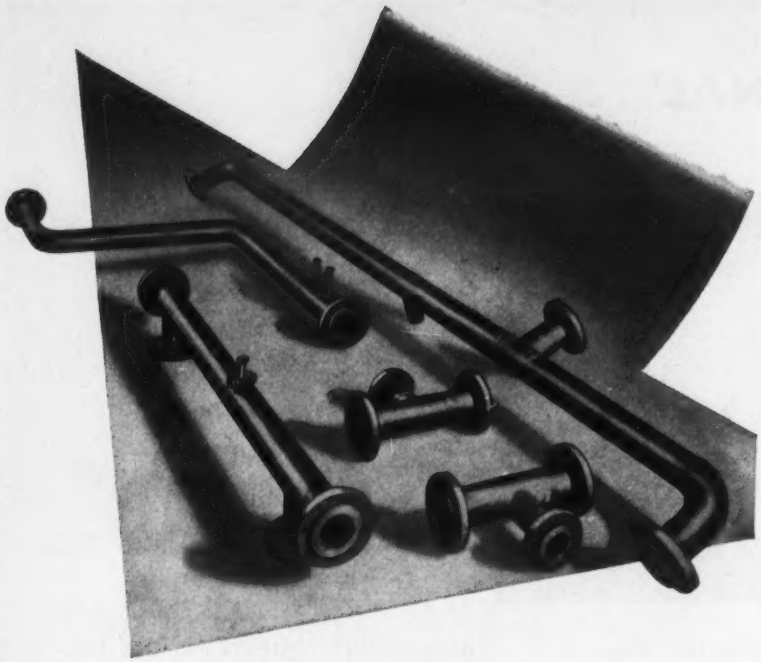
"NATIONAL" Guarantees *Greater Value*—through:

- A thorough analysis of your drying problem by a team of experts.
- The use of proven standards integrated with prescribed design.
- In-plant design and production of all major components to assure consistent quality and maximum savings.
- Personal oversight, from initial proposal to proven performance.
- Complete service, including survey, analysis and recommendations.

DRYING MACHINERY FOR THE TEXTILE, CHEMICAL, PHARMACEUTICAL, FOOD AND OTHER INDUSTRIES

NATIONAL®

FORTY-FIRST YEAR • INSTALLATIONS AROUND THE WORLD



Tough piping problems made easier with AMPCO pipe

. . . the pipe that resists corrosion and velocity damage, withstands mechanical abuse

Put **AMPCO** pipe on your tough, liquid-handling jobs, and, mister, you've got something. First of all you've got pipe that's easier and less costly to install. It stands up under wrenches and hammers without thread distortion and subsequent leakage. It is readily welded with shielded arc procedures. "On-the-job" changes and maintenance may be done by the average weldor.

Pipe made from this unique copper-base alloy is hard, yet it's unusually tough — gives you Brinell hardnesses of 150 and tensiles up to 70,000 psi. It has high strength-to-weight ratios.

But here's the best part of the story. It is highly resistant to many acids and caustics. It has high velocity tolerance — permits flow rates up to 18-20 fps. It withstands the action of abrasive solids in suspension and resists cavitation-pitting. It combines the advantages of many different pipe materials without their drawbacks.

What's more, you can get **AMPCO** pipe in all standard sizes, many from stock. Fittings are also available to 3600 psi and flanges to 5000 psi. Write us now for full information.

AMPCO

AMPCO METAL, INC.
Dept. 131-G, Milwaukee 1, Wisconsin

West Coast Division
Huntington Park, Calif.
Southwest Division
Garland
(Dallas County), Texas

PR-160

Check 4758 opposite last page.

PEOPLE

From page 14

ant vice president. Riley was appointed vice president in 1960.

Tommy D. Greer, formerly vice president — Industrial Products Division, Texize Chemicals, Inc., is now administrative assistant to the president.

Dr. C. E. McGinn has been transferred from manager—chemical research, Buffalo Dyestuff and Chemical Research and Development Laboratories of Allied Chemical's National Airline Division, to assistant director of research, Solvay Process Division. He is succeeded by **George B. Middlebrook.**

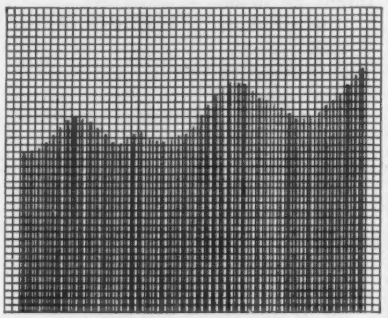
Dale W. Laudenslager, formerly production manager for Archer-Daniels-Midland Company's Industrial Chemicals Department, is now manager of the company's Peoria Chemical Center. New assignments have also been given **Herbert F. Davidson** and **Orlando Graziani.** Davidson has been named operations coordinator for ADM's Chemical Group plants at Los Angeles, Calif.; Valley Park, Mo.; Pensacola, Fla.; Newark and Elizabeth, N.J.; Ashtabula, Ohio; Wyandotte, Mich., and the Peoria Center. Graziani becomes operations engineer for entire Chemical Group.

Previously consultant and member of board of directors of Kenrich Petrochemicals, Inc. and two subsidiaries, **Hermann Rogge** has been elected president.

A. E. Staley Manufacturing Co. has two new vice presidents—**L. E. Doxsie,** vice president for corn, grocery products and overseas divisions; and **Dr. James A. Bralley,** vice president—research and development.

Investigating promising new products and expediting their commercial production will be responsibility of **Kenneth R. Osborn,** appointed to newly-created post of director of industrial development of Allied Chemical's General Chemical Division.

accurate visual display of up to 47 measurements

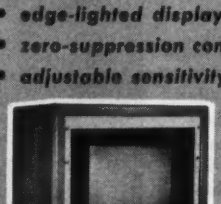


with the ATL

PROFILE MONITOR

For graphic readout of temperature, pressure, strain, velocity, and similar variables, the ATL Profile Monitor scans up to 47 channels, each 20 times per second, triggers an alarm when a calibrated, adjustable set point is exceeded. Available for rack or cabinet mounting.

- *17" CRT display*
- *edge-lighted display grid*
- *zero-suppression control*
- *adjustable sensitivity*



Write for full information

ADVANCED TECHNOLOGY LABORATORIES
A DIVISION OF
AMERICAN-Standard
369 WHISMAN ROAD • MOUNTAIN VIEW, CALIFORNIA

Check 4759 opposite last page.

Dust collectors: cloud of controversy

Sirs:

Your April issue (p. 68) presented an extremely interesting review entitled "Bag failures are top woe of dust-collector users." Your survey was evidentally based on approximately 354 chemical plants which represents an excellent cross section of the dust-collecting field.

I enjoy receiving your magazine. Your nomographs are extremely interesting and we have found quite a few that have been helpful to us in our air moving business.

W. E. Tracy
Product Application Engineer
Sturtevant Division
Westinghouse Electric Corp.
Boston

Gentlemen:

In the April 1961 issue of Chemical Processing appears an article entitled "Bag failures are top woe of dust-collector users" (p. 68). As one manufacturer of fabric collectors, I fail to understand the purpose of such a title. The statement is not only an inferred criticism of fabric collectors, but cannot avoid creating impressions detrimental to the welfare of fabric collector manufacturers and contrary to the public interest.

Editorial gimmicks may attack interest, but they certainly do not advance the prestige of an important industry. They only tend to discount the value of a large investment made in money and effort to develop better solutions for a greater number of increasingly complex dust control problems.

In the case of fabric collectors, periodic replacement of filter bags is a cost of the superior particulate collector efficiency obtainable only with this type of dust collector. Other types of dust collectors, too, have advantages and disadvantages and you can be sure that a fabric collector is seldom installed if a less expensive device appears capable of satisfying the need.

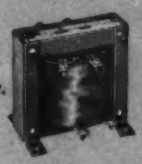
We agree that bag failures

SQUARE D SPIN TOP® ENCLOSURE NOW MORE VERSATILE THAN EVER!

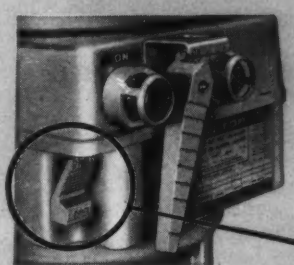
DAMAGE-RESISTING **Acme threads. If you've struggled with "banged-up" threads, you'll appreciate this feature. It's always a breeze to put on and take off tanks for installation, inspection or maintenance.**

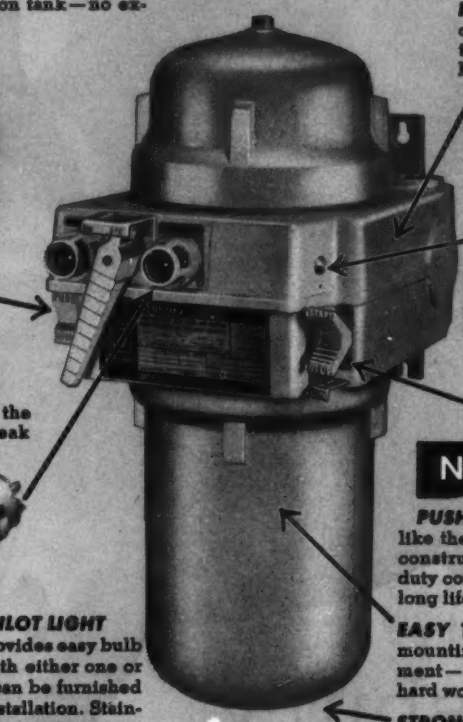
FULL WEATHER PROTECTION **• Male threads on collar engage female threads on tank—no external threads to be damaged.**

NEW! ***CONTROL TRANSFORMER*** **can be mounted in collar. No special-length tanks required.**



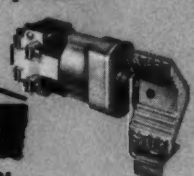
INCREASED WIRING SPACE **• Four conduit openings standard, with through-feed conduit entrances for horizontal tap-offs optional.**





NEW! ***SELECTOR SWITCH*** **is made in one piece, installs simply by threading into opening provided in enclosure. One-piece construction permits pre-testing before shipment.**

NEW! ***RECESSED CONTROL STATIONS*** **like the reset button are out of the way, have no protrusion to break or bend accidentally.**



NEW! ***PUSHBUTTON,*** **like the selector switch, features one-piece construction for easy installation. Heavy-duty contacts and rugged mechanism assure long life.**

NEW! ***BRILLIANT PILOT LIGHT*** **is visible from all angles and provides easy bulb change. Enclosure available with either one or two factory-mounted lights or can be furnished with plugged holes for field installation. Stainless steel thread-in-thread construction gives corrosion-resistance and easy servicing.**

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STRONG AND LIGHTWEIGHT **construction. Complete enclosure is cast aluminum. All operating shafts are stainless steel, thread-in-thread, for the best in corrosion resistance.**

Square D is Better in So Many Ways!

When you buy from Square D, you not only get all the benefits shown above—you also are buying from the only manufacturer who builds both the enclosure and the starter, giving you unit responsibility. Moreover, Square D offers better stocks, better on-the-spot service. That's why it makes sense to insist on Square D Spin Top enclosures for your hazardous location applications.

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Square D Spin Top enclosures are NEMA 3 (weatherproof), NEMA 4 (watertight), NEMA 7 (explosion-proof) and NEMA 9 (hazardous locations) for Class I, Group C and D; and Class II, Groups E, F and G service.

Write for Bulletin 9990. Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

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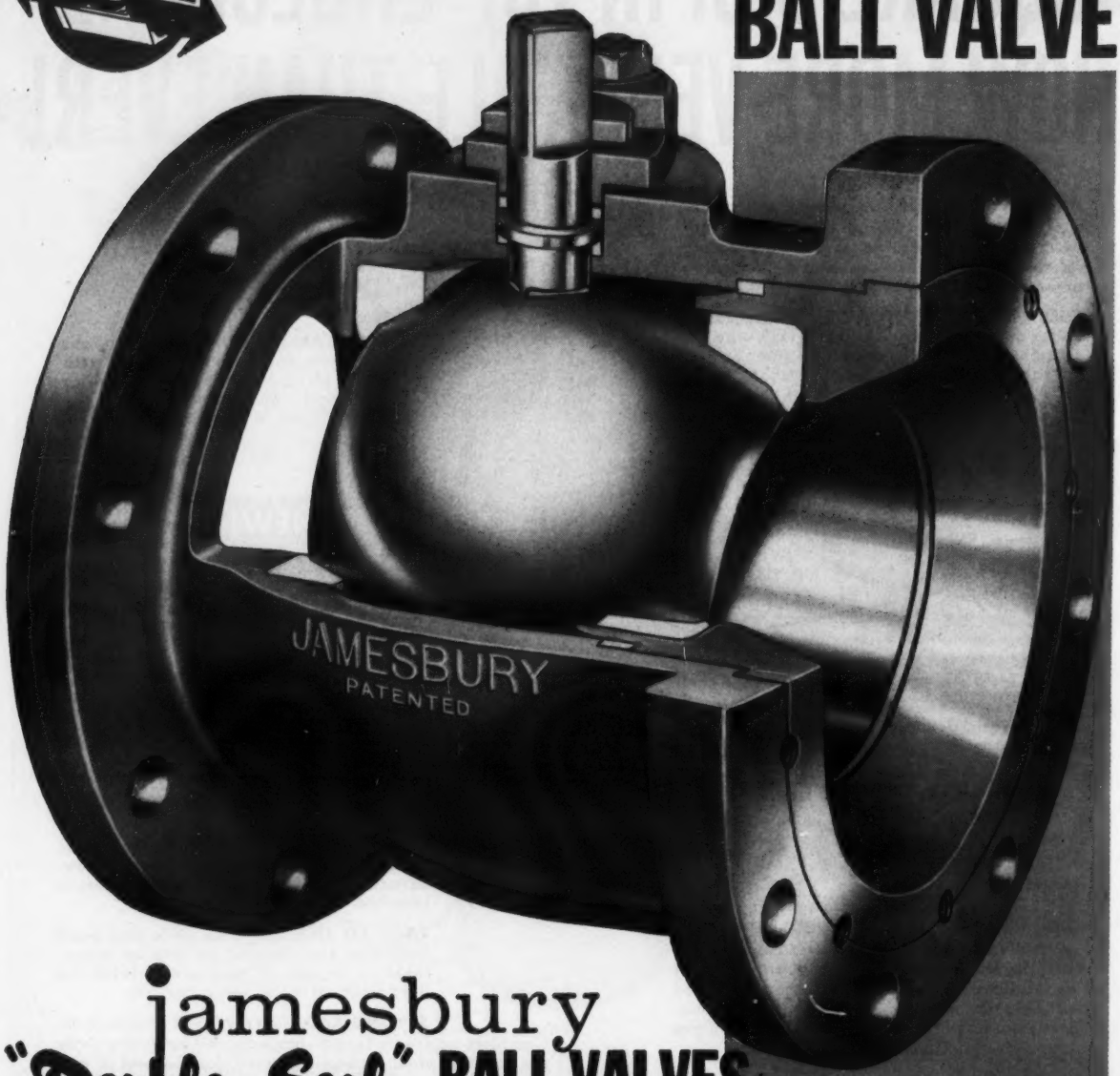
Check 4760 opposite last page.

Close-up of Industry's MOST VERSATILE BALL VALVE



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"Double-Seal"™ BALL VALVES*
*Patented

The Jamesbury "Double-Seal" Ball Valve design is particularly applicable to handling fluids below —150°C. The floating ball principle assures effective seal and compensates for the variation in shrinkage rates between constructional and seating materials. Jamesbury offers a complete line of valves for Cryogenic service all of which are available for manual or remote operation.

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Jamesbury "Double-Seal" Ball Valves are available in Types 303, 316 and Alloy 20 Stainless Steels, Carbon Steel, Bronze, Ductile Iron, Monel, Aluminum and PVC. Other materials on special order.
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SIZES
Screwed End: ¼" through 3".
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150# series—½" through 12"
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Ask for complete "Double-Seal" Ball Valve Literature.

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DISTRIBUTORS IN PRINCIPAL CITIES

Check 4761 opposite last page.

are a matter of concern to both manufacturers and users of fabric collectors. As a manufacturer, we also know that dust collection equipment is often low on the routine maintenance and inspection list. Unquestionably, many fabric collector users would have fewer bag failures and breakdowns if reasonable and proper inspection and maintenance programs were initiated and enforced.

HANDLE S. HAWS
Manager
Dust Filter Department
Metal Products Division
Koppers Company, Inc.
Baltimore

It was not our intent to criticize the value of the very popular bag collector. The fact that 246 such units are used in the 354 installations reporting in the survey on which the article is based attests to the excellent job being done by these versatile units. (In fact, CP gives continuing coverage to news of how such collectors are solving tough processing problems.)

In the interests of a realistic evaluation for user as well as manufacturer, the article does summarize the major causes of operational problems as reported by operating men participating in the study. Readers interested in the complete dust-collector survey should write to Research Department, Putman Publishing Company, 111 E. Delaware Place, Chicago 11, Ill.

—ED

Co-op opinion

To The Editor:

Your article on page 29 of your May 1961 issue is an interesting one ("Should co-ops pay 52% Federal income tax?"). The article on taxation of cooperatives is very nicely written; however, we in cooperatives would like to express our feeling on this subject sometime without having to pay for the space.

As you may know, Mr. John C. Satterfield, president elect

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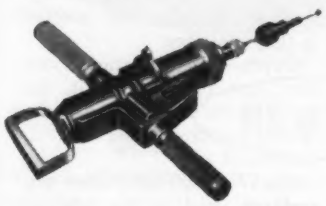

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CC-475 Cleaner removes tough deposits fast. Built-in flushing system cools drill and flushes chips. Weighs just 10 pounds. Accessories available. Complete line of air-powered direct-drive and geared tube cleaners.

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Representatives in principal cities of the free world.

Check 4762 opposite last page.

of the American Bar Association, recently stated, "tax favoritism, tax advantage or tax discrimination in favor of cooperatives does not exist." He is the attorney for the Mississippi Chemical Company mentioned in your article, and has had many years experience in this field. As President Elect of the ABA., he is also outstanding in all phases of legal work.

You did not mention Railway Express or Associated Press being cooperatives. There are many cooperative organizations in the United States other than farmer cooperatives.

Farmers were forced into business in which they were not being paid fair prices for their products, and businesses supplying their needs because of price and quality being sold them for crop production.

You stated that cooperatives did 1% of the chemical processing industry business last year. It doesn't seem to me this is much to become excited about.

Any chemical company can refund all the proceeds above cost as refunds to customers, and as you say have the same tax advantage as any cooperative. Cooperative businesses as such do not make net savings. Under existing laws the "savings" belong to member-owners. Any of these "savings" which are added to surplus is subject to the regular corporate tax rate the same as non-members or government income.

J. Raymond Franklin
North Iowa Co-operative
Processing Association
Mason City, Iowa

Dear Sir:

Your article entitled "Should co-ops pay 52% Federal income tax?" is the most objective I have seen in a trade publication on this highly controversial, misunderstood and emotional subject.

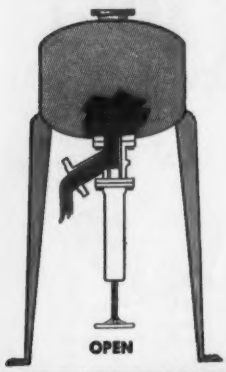
Owen Cooper
President
Mississippi Chemical
Corporation
Yazoo City, Miss.

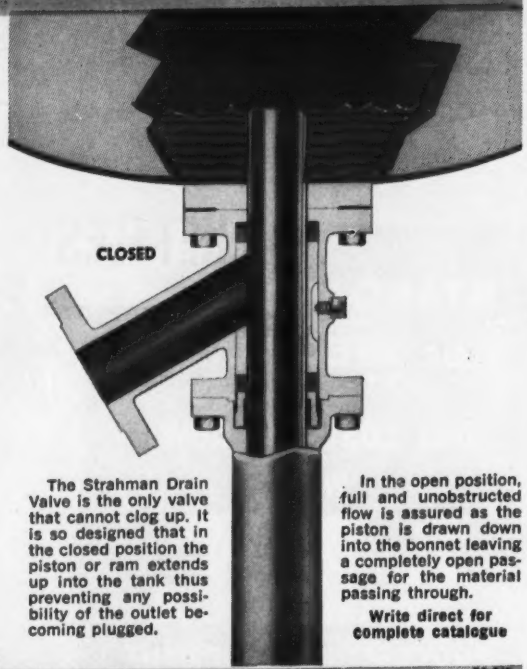
Check 4763 opposite last page.

Strahman RAM TYPE DRAIN VALVES

FLUSH BOTTOM VALVE
THAT WILL NOT CLOG

Designed for Chemical and Pharmaceutical industries





The Strahman Drain Valve is the only valve that cannot clog up. It is so designed that in the closed position the piston or ram extends up into the tank thus preventing any possibility of the outlet becoming plugged.

In the open position, full and unobstructed flow is assured as the piston is drawn down into the bonnet leaving a completely open passage for the material passing through.

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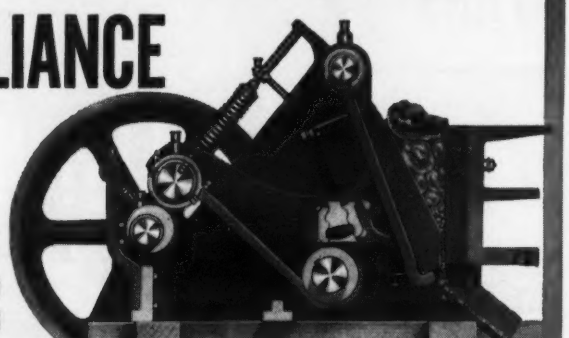
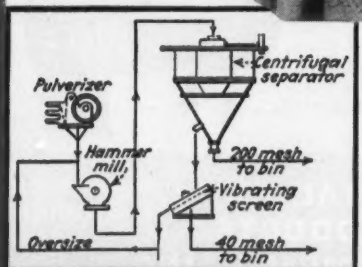
Check 4764 opposite last page.

LEVER-TYPE PULVERIZER
by RELIANCE

CRUSHES HARDEST MATERIALS
¼" to dust in one operation





Successfully reduces limestone, emery rock, sand stone, granite, shale, iron ore, many others. No pre-breaking needed.
Ideal for first-stage preparation of material to be passed to a grinding mill and separator . . . see drawing.
Heavy-duty all-steel construction. Very low maintenance cost. Backed by 50 years experience.
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Check 4765 opposite last page.

Watching Washington

Counterfeit-drug Sleuthing Rivals FBI Techniques

The FDA's job of spotting counterfeit drugs and determining who made them is not easy. The work appears more like that done in FBI laboratories than what would be expected of an agency administering food and drug laws. Deputy FDA commissioner John L. Harvey recently described some of the steps involved.

Identifying drug-tablet replicas, according to Harvey, is a "ballistic" method similar in some respects to the FBI and police method of identifying a gun that fired a particular bullet.

The technique includes a systematic comparison of unknown tablets and capsules which authentic samples from known manufacturing sources. The system includes keeping the collection up-to-date with samples of legitimate drugs and all available samples of counterfeits.

"Gross-punch-marks" Examination of suspected tablets is the first step. These marks are characteristic of individual tablet punches. The examination proceeds to measurement of tablet diameter, thickness and weight and determination of tablet shape, color, type of score marks, bevel and surface (flat, concave or convex). Tablets are also looked over for presence of monograms or other identifying characteristics.

Low-power-microscope examination is the next step. This is to detect smaller punch marks on surfaces. Even when they are new, Harvey says, punches show various characteristic microscopic marks that can be used to differentiate them.

As they are used, punches develop other characteristic shapes, marks or imperfections that are impressed into the tablets and "positively identify a tablet with a given manufacturer's punch, just as fingerprints identify a human being."

FDA inspectors mount tablets in front of a light source so that a silhouette of the tablet is projected onto a screen. Sometimes they mount tablets under a microscope with the groove vertical, so that the width and depth of the groove or score mark and the angle of the groove can be measured.

Determination of the ingredients and study of their microscopic habit by the optical crystallographic method is the final step.

Capsule identification is similar, but more difficult, because there are fewer external charatceristics that can be compared.

Conventional laboratory procedures used in the agency's daily work are quite good, according to a Federal Court. The court upheld the validity of FDA tests to determine whether decomposed cream had been used to make butter.

FDA had charged that butter made by a Maryland creamery was produced from rotten cream. Expert testimony relied on results of the FDA total water insoluble acids (WIA) test, and the agency's butyric-acid test. Both procedures had been developed over a number of years by FDA labs.

The court was satisfied that the tests proved "beyond a reasonable doubt" that the butter was made from rotten cream. The creamery was fined $500, and two officers were fined a total of $500.

EXPORT SQUEEZE ON REDS — The value of export licenses issued this year for shipment of U.S. goods to Eastern Europe is one-third below the $35.4 million approved for the first quarter of 1960. The Commerce Department revealed that the principal items licensed for shipment to Eastern Europe include $6.2 million worth of chemicals and plastics to the U.S.S.R. and

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- High heat transfer capacity
- Compact units save space
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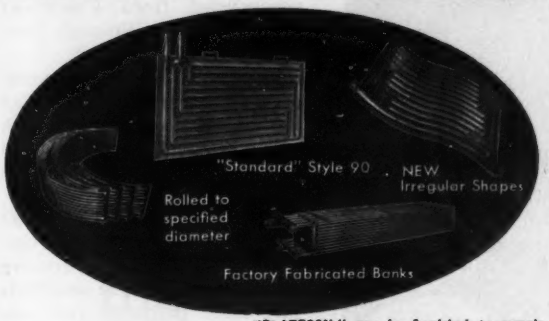

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VACUUM

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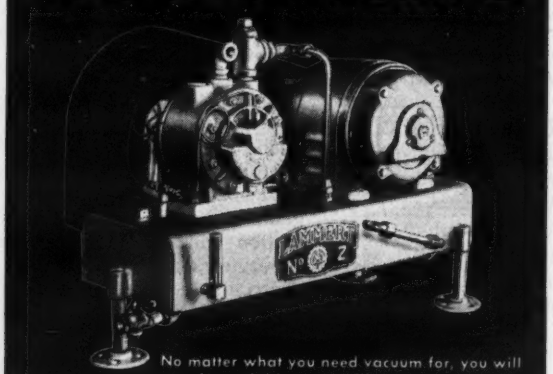

No matter what you need vacuum for, you will get dependable service from automatically lubricated Lammert pumps. Capacities—4.3 to 225 cubic feet per minute. From medium to high vacuum (up to 20 microns of barometer).

Write for catalog showing the complete line, including specifications, of Lammert pumps and compressors.

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Czechoslovakia.

Exports refused to the Iron Curtain area by the Commerce Department totaled $24.9 million. Included were $1.1 million worth of ion-exchange resins scheduled for various Eastern European spots and a small amount of synthetic rubber and cobalt metal slated for Czechoslovakia.

Among items approved for export license were technical data relating to installation and operation of pulp and paper manufacturing machinery, a phosphoric-acid plant and data on machinery for continuous spinning and processing of viscose-filament textile yarns.

Technical-data applications denied include data on a pyrolysis heater, a plant for petrochemical production and an ethylene and propylene plant.

AEC MATERIALS SHAKE-UP — The Atomic Energy Commission has reorganized its raw-materials program. The formerly separate foreign and domestic responsibilities of the Division of Raw Materials have been reassigned to a single newly established position of assistant director for procurement.

Thomas B. Upchurch, former assistant director for foreign procurement, holds the new position.

UTAH POTASH PUSH — The Interior Department has withdrawn 5,000 acres of extremely high grade potash-containing land from oil-and-gas leasing and made it available for potash development. The land is known as the Seven Mile area, eight miles northwest of Moab in southeastern Utah's Grand County.

The area contains one of the richest potash deposits in the U.S. It is only six miles from Cane Creek where 9000 acres of potash deposits were withdrawn from oil-and-gas leasing just a year ago.

The Seven Mile area had been under oil-and-gas leasing for over 20 years without discovery. The potash deposit was located through systematic drilling by private firms, an Interior Department spokesman said. The purpose of the present withdrawal of Seven

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FOR DRYING—

Chemicals • Pharmaceuticals • Antibiotics

Toteline dryer trays of molded fiber glass are stronger than steel, yet they weigh TWO-THIRDS LESS! They outlast and outperform metal trays. American Cyanamid Co. reported annual savings of 50 percent after switching to Toteline Dryer Trays. You too can make substantial savings with Toteline. Here's why . . .

- Toteline Trays have a longer life and a lower replacement rate than metal trays.
- Drying time is reduced because Toteline Trays do not absorb heat.
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- Toteline Trays will not chip, dent or warp. They are easier and safer to handle.
- You get more plus factors in Toteline than in any metal tray.

For further information and catalog sheets on Toteline chemical drying trays, clip and mail this coupon to us with your company letterhead, furnishing us with your name and title.

Name_____

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MF 9-CP

by TOTELINE

MOLDED FIBER GLASS TRAY CO., LINESVILLE, PA.

Chosen to Represent the U.S. Reinforced Plastics Industry at the 1959 International Trade Fair in Zagreb, Yugoslavia

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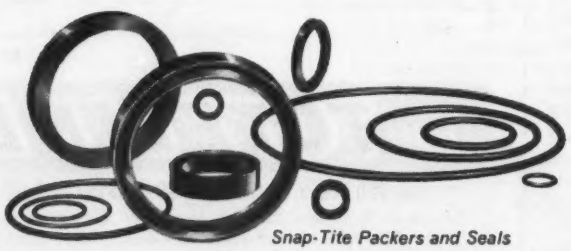
A complete choice of packers and seals permits Snap-Tite quick-disconnect couplings to handle over 600 different fluids! *(some of them mighty tough)*

Whatever fluid you're working with, chances are Snap-Tite couplings can handle it. Because every-one of the thousands of Snap-Tite quick-connect valved couplings comes with a wide choice of rubber packers and seals, selected according to the fluid in use. The right choice, of course, is vital for the seal is the very heart of the coupling.

To assist you in the proper selection of coupling seal material, Snap-Tite, with the assistance of suppliers of synthetic rubber materials, has recently compiled a comprehensive Packer Usage Guide —the first of its kind in the industry.

For the Packer Usage Guide, and for complete information on the correct choice of quick-connect, quick-disconnect couplings for the fluids *you* use, write Snap-Tite, Inc., Union City, Pa.



Snap-Tite Packers and Seals

Snap-tite

UNION CITY, PA.

ST-61-02

Check 4769 opposite last page.

Mile from oil-and-gas leasing so soon after the withdrawal of Cane Creek is to make possible joint potash development of the two areas.

At Cane Creek, construction already has started on a 22′-diameter 100′-deep shaft, and plans have been completed for an 8000-tpd potash plant. A 36-mile spur-rail line will be constructed from Crescent Junction, Utah, through Seven Mile to Cane Creek.

Private interests already have spent more than $2.5 million in exploring potash reserves, and it is estimated another $20 to $30 million is needed for development.

EXIT HOOK & LADDERS? — The Atomic Energy Commission and the Department of Health, Education and Welfare have prepared two new instruction courses for firemen fighting fires involving radiation hazards.

The agencies feel that the problem has grown too large for the small field-instruction force maintained by the AEC. Increasing use and transportation of radioactive materials calls for a new approach, the AEC believes.

State trade-and-industrial education programs for years have provided fireman training. The new courses are designed for inclusion in such courses. A forerunner to additional training materials is a four-hour orientation unit entitled "Peacetime Radiation Hazards in the Fire Service." It consists of an instructor's guide, student manual, charts.

The four-hour program will be followed shortly by a 15-hour basic course. Fire organizations can obtain information through their state supervisors of trade-and-industrial education.

Materials covering the four-hour orientation unit are available through the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. The student manual is 30 cents, the instructor's manual is 35 cents. Extra copies of the charts are available in limited quantities from the Trade and Industrial Branch, Division of Vocational Education, U.S. Office of Education, Washington 25, D.C.

OPERATING MANAGEMENT'S OWN MAGAZINE

CHEMICAL PROCESSING

JULY 1961

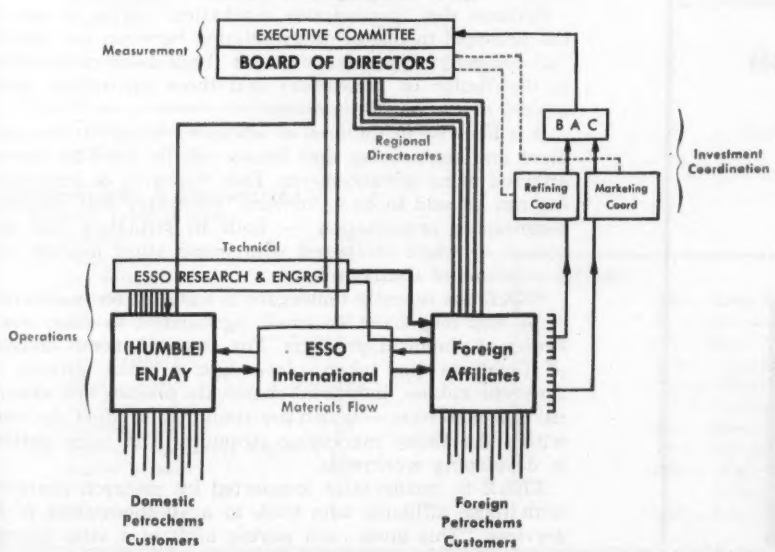
Profile of Progress

Jersey Standard . . . Chemical success with a management structure that 'simply couldn't work'

Now twelfth in chemical-company sales in the world, Jersey proves that a complex, far-flung network of manufacturing facilities and marketing affiliates can be closely knit and well coordinated

By JOHN MELLECKER, Editor-New York

Organization chart showing petrochemical interrelationships
Standard Oil Company (New Jersey)



OF EVER-GREATER importance as a supplier of petrochemicals and petrochemical raw materials, Standard Oil Company (New Jersey) bears close study by the chemical industry. This is particularly true at this time, inasmuch as "Jersey's" chemical operations are the subject of so many conjectures as to what direction they will take and what management philosophy lies behind them.

Jersey has risen to twelfth in chemical-company sales on a world-wide basis. What Jersey is and where it is heading will have significance in the planning of others in the chemical field the world over, for some time to come. For, Jersey's customers are the Free World's chemical manufacturers. And at the same time, the far-flung organization is increasing its activities as producer of more sophisticated petrochemical derivatives — in effect as competitor.

It remains to be seen whether Jersey's giant-scale resources in capital, materials, talent and plant can be channeled to achieve chemical results proportional to that expected of a firm specializing in chemicals, considering the complexity of exploration, leasing, production, transportation, refining and consumer-marketing responsibilities which are part of Jersey's allied oil-industry operations.

The direction and degree to which Jersey may continue to expand chemically is subject to many factors. This article probes Jersey's: a) available resources believed pertinent to chemical growth potential, b) chemical-operations organizational structure, and c) future potential, based on analysis of factors which are relevant today.

Vast Array Of Products, Services Offered

Starting in 1918 as the world's first commercial producer of petrochemicals (isopropanol by a process based on the Carleton Ellis patent), Jersey today produces a wide range of petrochemical products which may be broadly classified as follows: basic petrochemical raw materials; intermediates and derivatives; end products and solvents.

These are the basis for listing of the world-wide product line in Table 1, which indicates where these products are produced. From this it can be seen that Jersey's petrochemical leadership was originally derived by producing commercially-important petrochemical products from the complex refinery-stream mixtures in which they are formed, and more recently from operations carried out for the specific purpose of making basic chemical raw materials.

Today, Jersey rightfully takes pride in its ability to isolate or make from petroleum streams an additional selection of hydrocarbons for commercial use. For example, Jersey's separation skills now make commercially feasible the differentiation between straight-chain and branched-chain hydrocarbons from refinery streams. And

THESE ARE TOP MEN

. . . in 'Jersey's' petrochemical management

Operations — domestic & foreign

Dr. John E. Wood, III
president, Enjay

Domestic sales & technical service

H. J. Rose,
v-p Esso International,
in charge chemicals operations

Movement of materials between affiliates

Dr. Charles L. Fleming,
v-p & director
chemicals activities,
Esso Research & Engineering

Technology — effective use of Jersey's resources

Foreign investment analysis

Robert M. Jackson,
chemicals coordinator
for Board Advisory
Committee (BAC)

Facilities built by Jersey to serve customer needs

P. Lang Richards,
chemicals coordinator
of marketing, BAC

Foreign business coordination

new polymerization techniques developed within the Jersey technical complex have resulted in better polymers — both plastic and elastomers.

Ten years ago, large contributors to Jersey's chemical income were light olefins and diolefins — ethylene, butadiene, etc. Today, other products, many resulting from *chemical conversions* of basic chemical raw materials, produce a large share of income. Yet sales of the basic building-block ethylene to other chemical manufacturers is now about one billion lb/yr, which makes Jersey the world's largest "merchant" ethylene producer. When the ethylene produced for internal consumption is added, it can be seen that Jersey is one of the world's largest producers of this vital material.

An essential resource for the world chemical industry is Jersey's network of manufacturing facilities and its many chemical marketing affiliates — serving all industrial regions. The Humble-Enjay combination is Jersey's U.S. manufacturing-marketing operation in chemicals. This, together with a network of overseas marketing affiliates locally backed by plant facilities for products which, mainly, cannot be economically shipped over long distances, in effect puts Jersey products and a fully competitive outlay of services at the availability of its customers' process plants — at home or overseas.

'Tailored' Products Gain

"Prescription marketing" — helping with customer need for "tailored" products for certain types of manufacturing operations such as for plastic products or incorporation of additives in lubricating oils — is gaining steadily increased emphasis within Jersey marketing groups.

Enjay's efforts in this connection, particularly with polymers and backed by technical service and product development laboratories in Linden, N. J., Baton Rouge, La., and Baytown, Tex., are quite advanced. Similarly, the Abingdon, England, laboratories operated by Jersey's research affiliate, Esso Research & Engineering, provide aids for marketing affiliates serving Europe, the Mediterranean and North and West Africa.

Perhaps this "prescription marketing" factor is one of the principal means of differentiating between the typical "oil company" type of operations (bulk sales of products to distributor or converter) and those operations more typical of chemical companies.

It is likewise in the area of advanced research, development and engineering that Jersey can be cited as having attained many advancements. Esso Research & Engineering can be said to be a "mature" chemistry and chemical engineering organization — both in structure and approach — when compared with many other modern organizations of similar mission.

ER&E has recently undergone a series of reorganization steps that may have no small significance to other marketers of chemical products. For example, some division of functions has taken place into product groups — synthetic rubber, industrial chemicals, plastics and chemical raw materials — which are similar to product divisions within the Enjay marketing structure. The same pattern is developing worldwide.

ER&E is, incidentally, supported by research contracts with those affiliates who wish to avail themselves of its services. "This gives each paying affiliate a vital interest

in its operations," comments ER&E's Dr. Charles R. Fleming, who directs its chemical activities.

Communications Stressed

One of the most vital links in the Jersey world-wide chemicals operation is communication among affiliates. On the technical level, communications are carried on by ER&E through regular meetings with affiliate-contractors plus spring and fall "Research Review" meetings for technical representatives from their affiliates.

Moreover, overseas affiliate-contractors are visited periodically each year by principals from ER&E, and once each year a full-scale technical meeting is held by ER&E in Europe. Formal research reports are routinely supplied to affiliate-contractors. This means that affiliates can receive the same basic flow of information, regardless of their size. Thus, and particularly in the area of processing, a vast amount of technically-vital information receives wide circulation within the Jersey network.

An interesting aspect to this communications activity is the importance attached to it by industry-hungry nations such as Sweden. Recently, when Svenska Esso A.B. (Jersey-Swedish affiliate) evinced interest in a steam cracker for local production of ethylene and propylene, plus the possibility of a polypropylene manufacturing facility, there was considerable favorable mention in the Swedish press following Svenska Esso's announcement of their going ahead with this basic chemical project which would be backed up by ER&E technology. Press emphasis was on the benefit to Sweden, in its forging ahead industrially in these promising areas.

Last, but not least in this brief resume of Jersey's

To Page 77

TABLE 1—What Jersey Produces—and Where

Basic Petrochemical Raw materials	
Light olefins	
Ethylene	BT,BW,BR,ENG,GER, FR,CA,AU[2],SW[1].
Propylene	BW,BT,BR,GER,FR,ENG, CA,SW[1]
Isobutylene	BT,BR,BW,FR[3]
Nonene/tripropylene	BR,BT,CA,BW
Tetrapropylene	BW,BT,BR,CA,FR,GER[3]
Pentene	BT
Diolefins	
Butadiene	BR,BT,CA,GER,FR,ENG, AU[2],SW[1],JAP[2]
Isoprene	BR
Dicyclopentadiene	BR
Methyl cyclopentadiene	BR
Heavier olefins	
Heptene	BR,BT,ENG
Isooctane	BT
Aromatics	
Benzene	BR,BT,HOL[1]
Orthoxylene	BT, BR
Paraxylene	BT,HOL[1]
Toluene	BT,HOL[1]
Naphthenic acid	BE[2],AR,CH,EV,COL, PE
Feedstocks (aromatic tars) for production of	
Carbon black & petroleum resins	BT,BR,COL,CA
Intermediates & Derivatives	
Alcohols (acid process)	
Ethanol	BR
Isopropanol	BR
sec-Butanol	BW
Alcohol derivatives	
Ethers	BR
Ketones (acetone, MEK, MIBK[1])	BW
Ethyl acetate	BR
sec-Butyl acetate	BW
Isopropyl acetate	BR
Oxo alcohols (generally higher C's)	
2-Ethyl hexanol	BR[3]
C_4[3], C_8, C_9, C_{10}, C_{13}, C_{15}, oxo alcohols	BR
Detergent alkylates	
Dodecylbenzene	CA,FR
End Products	
Petroleum additives (fuel & lube)	BE,BW,ENG,FR,CA
Polymers & resins	
Polisobutylene (vistanex)	BR,BW
Conventional butyl	BR,BT,FR[3],ENG[1]
Halogenated butyl	BR
Butyl latex	BR
Polypropylene	BT,SW[1]
"Buton" synthetic drying oils	BR,BE
Petroleum resin	BR,FR
GRS rubber	AU[4]
"CTLA" polymer (low-cost resin for foundry core binders, passboard, etc)	BR,CA
Solvents	
Aromatic	BT,BEL,HOL[1],AU[1], AB
Aliphatic	BR,BT,CA,ENG,FR, GER,NOR,PE,ARG,AR, AM,AB
Agricultural Chemicals	
Ammonia	AR[1],COL[1]
Other	
Sulfur	ENG,GER,AR,ITA,AU
Hydrogen Sulfide	BT,BR,FR,BW,CA,BIL

CODE:

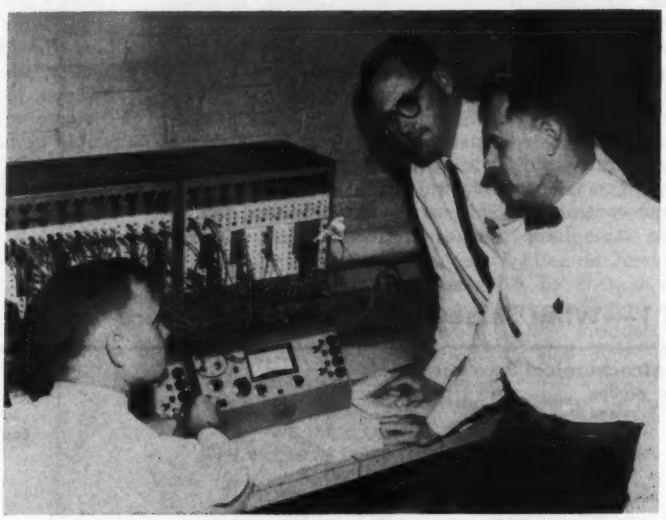
BR — Baton Rouge (La.)	**AR** — Aruba, Neth. W. I.	**JAP** — Japan
BE — Bayonne (N. J.)	**AU** — Australia	**NOR** — Norway
BT — Baytown (Tex.)	**BEL** — Belgium	**PE** — Peru
BW — Bayway (N. J.)	**CA** — Canada	**SW** — Sweden
BIL — Billings (Mont.)	**COL** — Colombia	1. Approved project
CH — Charleston (S.C.)	**ENG** — England	2. Project under construction
EV — Everett (Mass.)	**FR** — France	3. Through partial interest (SOCABU)
AB — Abadan, Iran	**GER** — Germany	4. Joint venture
AM — Amuay, Venezuela	**HOL** — Holland	
ARG — Argentina	**ITA** — Italy	

CHEMICAL BUSINESS

Table-top computers pay their way at Monsanto Plastics

Company's experience at Springfield indicates that small analog computers *can* pay for themselves with a single important process study. But chances are their introduction into the procedures of engineering and research groups will be gradual

As told to **JOHN MELLECKER**, Editor-New York
by **JOHN H. McCOLLISTER** Technologist
Plastics Division, Monsanto Chemical Company
Springfield, Mass.



Monsanto Plastics Division's systems-engineering-trained specialists shown at "slaved" pair of PACE TR-10 table-top analog computers, made by Electronic Associates, Inc., Long Branch, N. J. L to R: Fred C. Gore, George C. Vincent, John H. McCollister

THE desk-top, completely-solid-state analog computer* is an enticing aid for solving processing problems through electrical simulation of chemical and physical operations. Not only can conditions be varied more widely than many pilot-plant experiments can permit, but the eternal question of how to get most productivity for least capital investment can be quickly solved from a broader-than-usual pattern of alternatives.

How do these amazing capabilities find use in chemical plant services? Let's look at what Monsanto's Plastics Division, Springfield, Mass., has been doing with two PACE TR-10 analog computers.

Here progress has been made in process simulation, but much remains to be done in measuring and characterizing equipment and process parameters. The computer is an excellent tool for studying the many non-linear relationships which are typical of polymer syntheses. It is, however, only one of several approaches being used to attack these problems.

*Such as Electronic Associates' PACE TR-10 and Donner Scientific's model 3500.

Cooling-water Study

One example of use concerning the step-wise expansion of an existing plant is as follows: It became necessary to determine whether the existing supply of cooling water would be adequate for a contemplated expansion. The equipment involved is a closed-circuit treated cooling water system for a batch-type exothermic reaction. Equipment configuration and changing specific heats make the hand solution of the resulting equations rather lengthy.

To solve this problem, data were collected with existing kettle equipment to enable the analog computer to simulate the relationship between cooling-jacket performance and demands arising within the kettle as the exothermic polymerization reaction proceeds through its cycle.

The computer solutions indicated that the required cooling cycle could be attained with the available cooling water. In this instance, the use of this tool helped to avoid the expenditures of a large amount of capital.

Helps Semiworks Plant

In another example, a malfunctioning problem arose in an interim production plant. Study of the process as a whole, aided by the analog computer, suggested a different concept than had been previously assumed for the functioning of the process. Results from analog computer simulation indicated fundamental changes which led to a workable process in the pilot plant. Now the interim production plant is serving its normal function as a forerunner of larger units.

The small consoles have been used in preliminary investigations prior to more comprehensive studies on the large analog equipment in St. Louis. There are still many aspects of polymerization processes that require study before mathematical models can be confirmed.

Springfield engineers are using the computers to develop dynamic models of equipment. Pulse-testing techniques are used to obtain the experimental data. These data are then used to confirm or improve the theoretical model.

Other types of problems involve electromechanical systems such as constant-tension plastics winders and speed-regulated DC drives. Dynamic analysis of such systems entails use of simultaneous differential equations which make solution by computer necessary. Such systems, which have largely evolved through practical experience, prove to

To page 76

THE *Norelco*® NITROGEN GENERATOR

provides a highly economical and extremely convenient supply of liquid nitrogen. Since both industrial and biological applications are real and constantly expanding, there are many obvious advantages to this "push-button" on-the-spot supply.

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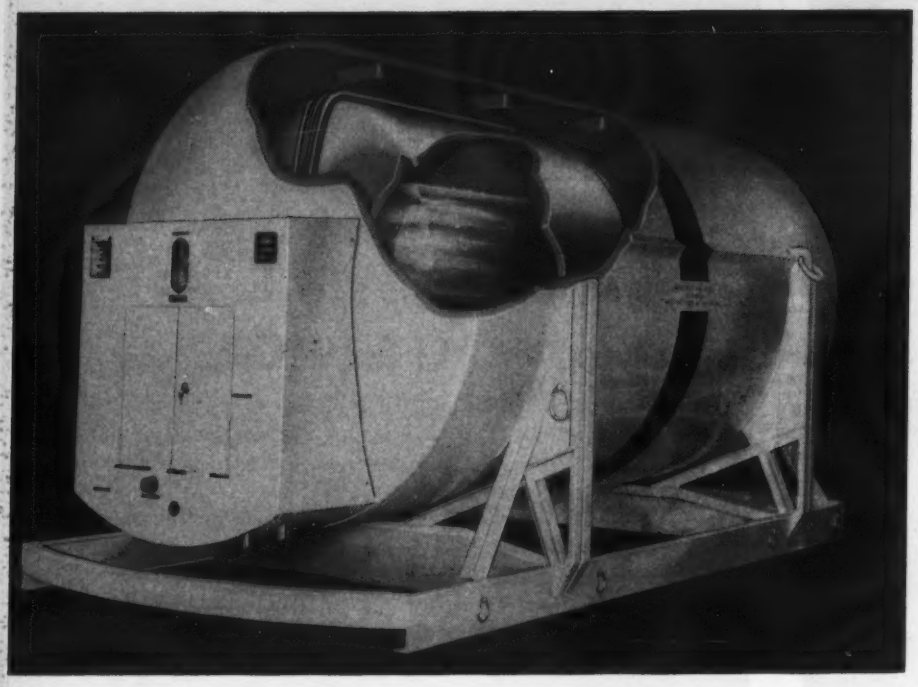
CHEMICAL PROCESSING



Powder insulation under vacuum is shown in annular space of this cutaway view of 2000-gal liquid oxygen transport tank, which consists of an inner and an outer vessel.
Photo Courtesy Hofman Laboratories

Check these factors when . . .

Insulating

Cost of insulation must be balanced against product loss, choice depending upon boiling point of fluid being handled, its value and type and size of equipment to be insulated

By **DR. A. MATESANZ**
Liquid Carbonic Division
General Dynamics Corporation

LOW-TEMPERATURE insulation plays a key role in industrial cryogenics, which may well become a billion-dollar industry by 1965. In fact, cryogenic insulation may have annual sales of $50 million itself by that time.

Recent construction of plants to produce liquid hydrogen and liquid helium — with boiling points below −400°F — has hastened the development of super-insulations, consisting of alternate layers of glass-fiber mat and aluminum foil, suitable for these liquids with smaller latent heats of vaporization and much higher production costs.

Although these super-insulations have much lower thermal conductivities than the more conventional cryogenic insulations, they are not always the best choice, even for handling liquids such as hydrogen and even less often for liquid nitrogen or oxygen.

For example, let us consider a 28,000-gal liquid-oxygen storage vessel, with a product loss rate of 0.1% per day or 35% per year. This loss could be reduced to less than 3% per year with super-insulation. However, the additional cost of super-insulation is such that it would take 20 to 40 years to pay off the additional investment if the present low cost of liquid oxygen is considered.

For a small container of 100 gal or less for liquid oxygen or nitrogen, super-insulation might be the best choice. For liquid helium, super-insulation is the only practical approach. This illustrates some of the factors that must be considered in selecting a cryogenic insulation. Let us go over these in detail.

First consideration is the cryogenic fluid to be handled, principal ones of which are shown in Figure I, with their normal boiling points. They are divided into two groups. Group A consists of those with boiling points from −128°F down to −320°F. Group B consists of those with boiling points from −411° down to −452°F.

It is certainly evident that it is much more difficult to prevent heat leakage from the outside to vessels handling the extremely cold liquids in Group B. Likewise, it is more difficult to prevent loss of product with Group B liquids.

Next factor to be considered is equipment to be insulated. A cold box requires an insulation that can be packed into space between heat exchangers and valves. Transfer lines present a different problem, storage vessels another and propellant tanks still another. As indicated previously, size of vessel is a factor.

For the colder liquids, a double-wall vessel with a vacuum is required. The thermal conductivity of the metal in the vessel piping and supports and of the insulation used are important.

Rock wool is frequently used in cold boxes for air-separation plants manufacturing oxygen, nitrogen or argon. It has also been used in methane-purification plants. Magnesia and perlite have also been used in cold boxes. Santocel and perlite are suitable for oxygen and nitrogen storage vessels. Asbestos, magnesia and glass fiber are used for lines and other equipment. Micro-Cel, a synthetic calcium silicate, appears to be advantageous for certain applications. These insulating materials are normally used without vacuum.

Dewar Flask Grows In Size

Dewar containers were originally used in small sizes in laboratories. As American industry has increasingly engaged in production and distribution of cryogenic liquids, Dewars holding 30,000 gal or more have been built. Vacuum requirements were lowered and different types of insulation tried so as to reduce losses by heat leak.

Heat transfer through insulations can be considered in terms of three factors: 1) radiation, 2) gas convection,

INDUSTRIAL CRYOGENICS

for cryogenics

and 3) conduction through solid particles and contact points. At high vacuum, radiation is the most important factor.

One approach to decrease heat transfer by radiation is the addition of opaque materials to the radiation-transparent powders. Santocel with copper or aluminum flakes, with a vacuum of 10 microns, provides an insulatory medium 10 to 20 times more efficient than the non-evacuated type consisting of a single material.

The same principle of cutting down on heat transfer by radiation was followed in the development of the super-insulations. These super-insulations consist of 10 to 80 alternate layers per inch of glass-fiber mat and aluminum foil. The super-insulations are 10 to 40 times better than the evacuated powders. This means product losses are 10 to 40 times less for the same size storage vessel. The greater the number of layers, the more efficient is the insulation, but also the higher the cost.

The foamed insulations — Foamglas®, polystyrene, polyurethane — have been used widely in recent years. They have special merit because of the fact that the cellular structure provides a vapor barrier and minimizes condensation of water and formation of ice when handling Group A fluids.

Economic Factors Govern Choice

Table II shows a number of typical cryogenic insulations, along with the factors that enter into the selection of an insulation for a specific purpose. In the right half of the table, information is given on the suitability of insulation for Group A, Group B or both groups of cryogenic fluids. As shown, in addition to fluid being handled, choice of insulation depends upon a number of other considerations.

Economic factors make non-

To next page

Figure 1
BOILING POINTS OF CRYOGENIC FLUIDS

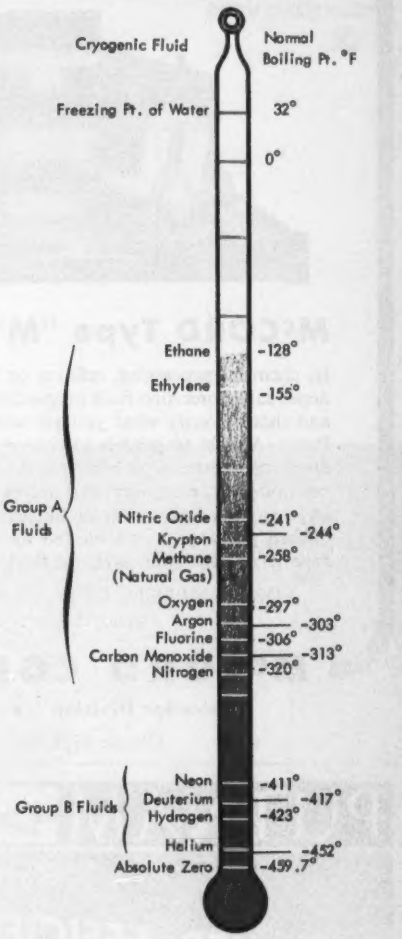


TABLE I

Cryogenic Insulations for Various Applications

Types of Insulation	Thermal Conductivity, K x 10^{-5} (Btu/hr/sq ft/°F/ft)	Boundary* Temp °R	Applied Vacuum (Microns)	Density lb/cf	Cold Boxes	Transfer Lines	Storage Vessels: Large (30,000 gal or more)	Storage Vessels: Medium (100 to 30,000 gal)	Storage Vessels: Small (Less than 100 gal)	Propellant Tanks in Rockets
Mineral wool and glass fiber	16-23	540	None	4-8	A & B**	A	A	—	—	—
Perlite	18	540-139	None	5-6	A & B	A	A	—	—	—
Polyurethane (Foam)	12-22	535	None	1.6-6	A & B	A	A	—	—	—
Foamglas	33	360	None	8-10	—	A	A	—	—	—
Perlite	1	540-139	10	5-6	A & B	A & B	A & B	A	—	—
Santocel plus Aluminum Flakes	0.25	540-139	10	6	B	A & B	A & B	A	A	—
Super-insulation (15 Al foils/inch)	0.11	540-139	1	2.2	B	B	B	B	A & B	B
Super-insulation (60 Al foils/inch)	0.025	540-139	1	6.8	B	B	B	B	A & B	B

*Single value designates mean boundary temperature. Two values designate warm and cold boundary temperatures. Temperature is in degrees Rankin, which can be converted to degrees Fahrenheit by subtracting 460. See Figure 1.

**Signifies suitability of insulation for Group A cryogenic fluids (bp of −128 to −320°F) and Group B fluids (bp of −411 to −452°F).

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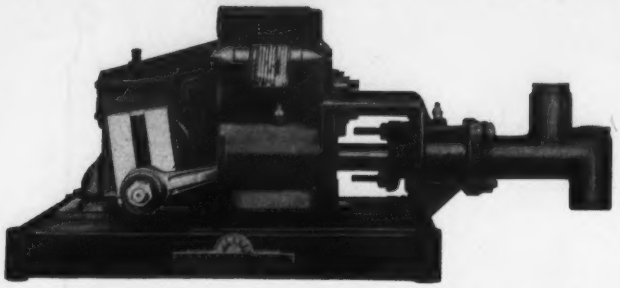

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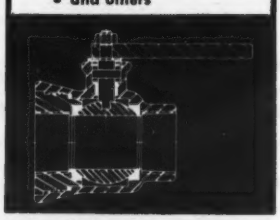

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Cryogenic insulation *From preceding page*

evacuated insulations of general use for Group A fluids in cold boxes, transfer lines and storage vessels of more than 30,000-gal capacity. Vacuum powder insulations are used with Group A fluids for storage and transportation vessels of 100- to 30,000-gal capacity. Externally-applied insulations such as Foamglas, polyurethane and glass fiber are used for transfer lines and miscellaneous equipment for Group A fluids. Evacuated Micro-Cel has recently been used for Dewar-type tankcars transporting liquid hydrogen, a Group B fluid.

Super-insulations have special applications for Group B fluids — hydrogen, helium, deuterium and neon — in the insulation of transfer lines and vessels. Super-insulation is difficult to apply to odd shapes or vessels with many pipes and support connections.

Super-insulations are often required for small-capacity containers handling both Group A and B fluids. Reason this is necessary is that small containers have a greater surface per unit of volume than large containers.

The fact that super-insulations maintain their insulating properties even under high pressure is an advantage. Some other insulations compress and thus increase the conductivity. Super-insulations are so strong that for some operations the container itself can be made of this material. Super-insulations are strong enough to support large pressures at the bottom or sides of the container.

It is possible that containers made of super-insulation may be used for liquid hydrogen tanks of interplanetary rockets. The conventional double-wall vessel will not be needed. Vacuum will be provided by space itself.

Cryogenic insulations also involve some particular problems and techniques not found for insulations at higher temperature levels. Some of the additional requirements are:

1—An adequate protective barrier
2—High vacuum systems
3—Low heat leak through supports and piping

If an adequate vapor barrier is not provided, water vapor will condense and solidify. The insulating properties will be reduced. Through repeated expansion during ice formation, foamed insulations may be destroyed.

When handling Group B fluids, other air components will condense and solidify, as well as water vapor. Condensation and solidification of these other air components present a possible hazard. Atmospheric air condensing on vessel walls tends to run down the walls, which act as a "wetted wall" column, with subsequent possible oxygen enrichment. This could present a considerable hazard in the event of possible hydrogen contamination by leaks.

Vessels Must Be Built To Maintain Vacuum

The achievement of the constant vacuums required demands special construction techniques for the jacketed vessels and pipes, with perfect control of welds by X-ray examination and very precise techniques of leak detection with the helium mass spectrograph.

"Getters," substances to adsorb large amounts of gases at low temperatures, even at very low pressures, are used to adsorb the residual gases and to keep a high vacuum for a longer period of time. Activated charcoal, silica gel and molecular sieves have been among those used. Proper construction techniques, plus the addition of getters, may be enough to keep a vacuum of one to 10 microns for a period of 10 years without need of reevacuating the vessel.

The first evacuation is sometimes carried out at 400°F temperature (degassing) to less than 100 microns. At liquid-oxygen temperatures, the vacuum later drops to one micron. Large vacuum-jacketed vessels will normally require periodical re-evacuation with an efficient vacuum pump and evacuating system.

The supports of the inner

To page 37

Design tips for

Cryogenic storage vessels

Size, working pressure, evaporation losses, insulation, maintenance of vacuum and method of filing must all be carefully considered for most economical design

TIGHT SPECIFICATIONS are the main requirement for efficient storage and transport of liquefied gases. Two well-designed vessels built to the same "loose specs" may differ appreciably in performance and efficiency.

One might hold its effective vacuum for a year or more before servicing; the other might need attention as often as once a week. Depending upon design detail, evaporation losses after normal periods of inactivity may be excessive for one design and practically negligible for the other. And again one vessel might operate without interruption while being filled, while the other must be shut down.

A vessel can be properly designed only after a very careful and detailed analysis of its expected operation. Each operating requirement should be satisfied in order of importance, so that the design criteria can be developed progressively. The operating requirements can be conveniently analyzed in terms of capacity, working pressure, allowable evaporation loss and operational procedures.

How Vessel Is Sized

Basically, the vessel is sized to meet existing requirements as governed by flow rate and frequency of use. But it might well be made oversize to anticipate increased demands at some future date.

The capacity of available transport vessels and the expected frequency of deliveries also affect the size of a storage vessel. The less reliable the supply service, the greater must be the contingency factor added to daily consumption figures in determining the working capacity of the vessel.

Much the same reasoning applies to transport vessels. The sizes, locations and servicing schedules of the storage vessels to be filled all influence the working capacity of the transport.

The final working capacity often represents an economic balance between actual consumption figures and the critical supply factors. However, calculating the design or total rated capacity of the vessel involves still more factors. It is good practice, for example, always to maintain some liquid in continuously operating vessels, to take care of unexpected contingencies and to assure top operating efficiency.

Residual liquid, as the minimum level reservoir is known, prevents the inner tank from "breathing" or taking in warm air from the outside. The warm air coming into contact with the cool walls condenses into ice particles that can destroy valve seats.

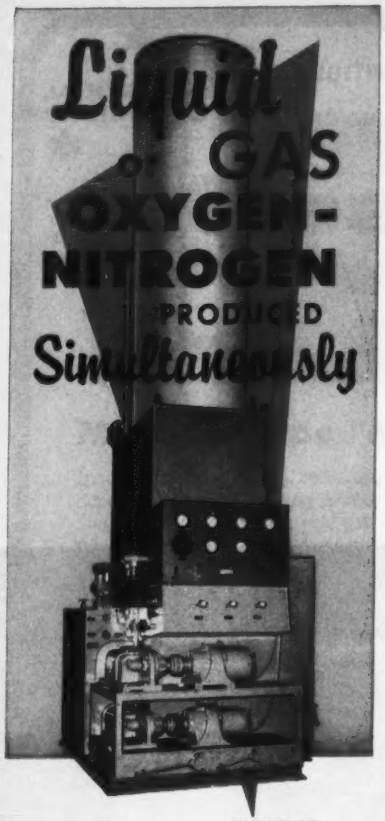
Residual liquid also helps control the size of the vapor area above the liquid level. As the liquid level drops, the vapor area increases and the pressure within the vessel decreases. This, in turn, can reduce the discharge rate.

A certain amount of vapor build-up is needed to establish

To next page

By **G. F. SULFRIAN,**
President
Hofman Laboratories, Inc.

Helium mass spectrometer sniffs for leaks in inner vessel of 500-gal nitrogen/oxygen storage container under test at Hofman Laboratories



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Cryogenic vessels

From preceding page

a basic minimum working pressure within the vessel to provide transfer or discharge pressure. This minimum is one of the factors governing the size of the vapor area. However, the frequency of discharge operations must also be considered. Care must be taken that the pressure build-up is relieved often enough to avoid excessive pressures that would pop the escape valve and blow vapor into the atmosphere.

A week-end is often used as the longest build-up period for computing vapor area requirements. Where vapor loss is a serious consideration, closed-cycle techniques can be used to reclaim the exhaust.

Working Pressure Kept To A Minimum

Working pressures are kept to a minimum where intermediate pumps are used to provide the delivered pressure and flow. Generally, 56 psig or less will do, since the pressure merely has to get the liquid into the pump line.

Internal working pressures of 250 psig or more may be needed when the vessel discharges directly to the end use point. The exact pressure depends upon how the supply is used and the state in which the liquid is to be delivered.

The working pressure has a profound influence on design and initial cost. Obviously, an increase in working pressures usually means greater wall thicknesses, more weight and changes in suspension system design. When the pressure is to go much over 250 psi, chances are it will pay to go to a lower-pressure vessel and a liquid pump.

Product Loss Determined By Insulation

The rate at which liquid in the vessel is unintentionally converted to vapor is known as the evaporation rate. It is normally expressed in cubic feet of vapor per hour or as a percentage of the working capacity that evaporates in 24

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hours. The rate of evaporation loss is determined by the effectiveness of the thermal insulation in the annular space between the inner and outer tanks of a vessel. This thermal insulation is affected by several design features, notably: by initial vacuum, vacuum tightness, insulation powder used and the number of inner-tank heat paths.

Small lab containers can be designed to hold a so-called hard vacuum of 10^{-5} microns or better. But storage and transport vessels for liquefied gases normally are evacuated to about 10 microns or less, considered a "medium" vacuum. Once the vacuum deteriorates to 250-300 microns, the vessel loses most of its insulating effectiveness.

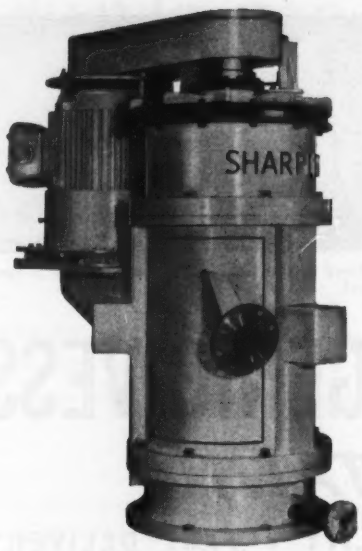
Vacuum Pump on Vessel Not Best Solution

Many vessels now in use lose enough vacuum through leaks or outgassing so that the annular space must be re-evacuated as often as every five days. Frequently the solution is permanently to install a vacuum pump on the vessel. At a cost considerably less than that of a pump, the vessel could have been designed and built at the outset to stand empty for six to 12 months without vacuum deterioration.

Most vessels are fabricated with a cold vacuum of about 10-50 microns. If the specs permit a leak rate of a 24-micron rise over 24 hours (as they often do), the minimum acceptable vacuum effectiveness can be reached in less than 10 days. At that time, the vessel must be serviced to restore the vacuum. Frequent servicing of a vessel to restore vacuum can be an extremely costly maintenance item for a plant.

Recently, it has been more common to specify a permissible leak rate of an 0.5-micron rise per hour. This keeps the vessel operable for a month between servicing. With rigid quality control and accurate test procedures, the leak rate can actually be held to an 0.02-micron rise per hour. At that rate, the vessel could

CENTRIFUGAL SKILL AT WORK



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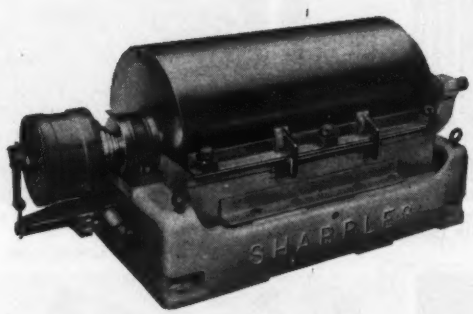
Write today for more information on the Super-D-Canter and how it can benefit your specific operation.



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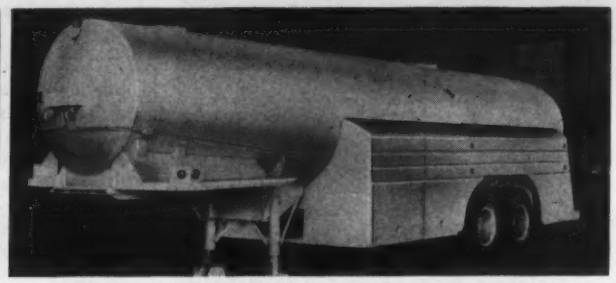
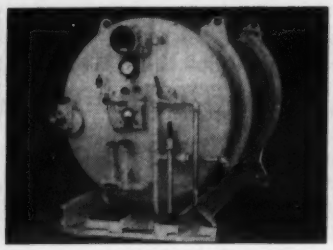
Check 4776 opposite last page.

1800 Gallon Liquid Oxygen Nitrogen Truck

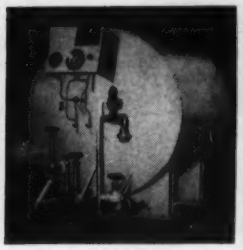


350,000 Cu. Ft. Self-Contained High Pressure Oxygen Recharger

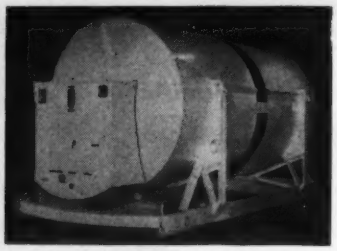
50 Gallon LOX Vessel



150 Gallon In-Plant LOX Vessel



U.S. Navy LOX Vessel



2000 Gallon U.S. Navy LOX Vessel

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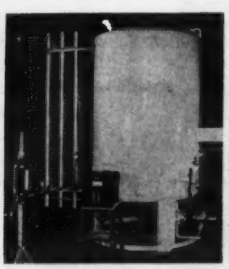
Liquid Oxygen Sub-Coolers

Oxygen, Nitrogen Converters



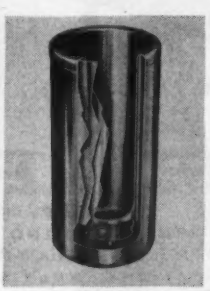
600 Gallon LOX Vessel with 1500 scfh Vaporizer

Lightweight Liquid Oxygen Pumps

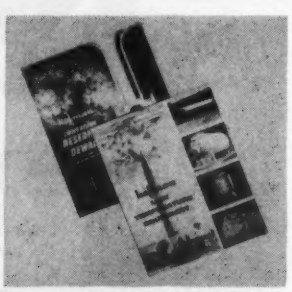
Standard Containers for Liquefied Gases

Helium and Hydrogen Containers

Stainless Steel Liquid Helium Dewars



Standard Open Dewars



Send for 64 Page Catalog and/or 48 Page Research Dewar Catalog

Check 4777 opposite last page.

Cryogenic vessels

From preceding page

operate continuously for more than a year without servicing.

Top Fill Line Desirable

One of the most controversial issues in the design of a vessel is the advisability of installing a top fill line. Although a single line is often used for filling and draining, good design calls for separate lines.

With a top fill line, the vessel can be filled while liquid is being drawn off so that supply services are not curtailed. Another distinct advantage is that liquid admitted through the top fill line passes through a spray feeder to the vapor area of the inner tank. The fresh liquid chills and condenses vapor that might otherwise be forced out through the safety valve as the liquid level rises.

Rates of fill and discharge must also meet operational requirements. Here again, though, an economic balance must be established between desired flow rates and cost. To increase the discharge rate, for example, it is necessary to increase the working pressure or the line size, or both. In any case, the cost is increased. When the line size is increased, a loss in thermal efficiency is risked because of the larger heat paths provided by the larger valves, pipe and couplings. ■

Cryogenic engineering conference

The 1961 Cyrogenic Engineering Conference will be held in Ann Arbor, Michigan, at the University of Michigan on August 15, 16 and 17. Preregistration information and copy of program can be obtained latter part of July from K. D. Timmerhaus, Secretary, Cryogenic Engineering Conference, University of Colorado, Boulder, Colorado.

Slide rule for gases covers acetylene, argon, carbon dioxide, helium, hydrogen, nitrogen, nitrous oxide, oxygen and propane. Thirty-eight properties are given for each gas. Slide rule for gases — Liquid Carbonic Division, General Dynamics Corporation.

Check 4778 opposite last page.

Cryogenic pumps and valves target for modified ductile iron

Economical material is readily cast; has 18 ft-lb Charpy V-notch impact at a temperature of −320°F

By W. K. ABBOTT, Metallurgist
Development and Research Division
The International Nickel Company, Inc.

EXTENSIVE tests have shown that a recently developed modified ductile cast iron has satisfactory impact strength down to temperatures of −320°F. Need for such an alloy in cryogenic pumps, valves and other equipment suggests it will be welcomed by industry.

Alloy has the desirable characteristics of ready castability into intricate shapes, machinability, simple melting procedure and conventional foundry practice. These factors and others give the alloy definite economic advantages over most other ferrous and non-ferrous alloys suitable for cryogenic service.

The alloy is designated Ni-Resist ductile iron type D-2C modified. It contains 21% nickel minimum, 3.75% manganese minimum, 0.5% chromium maximum, 3.0% silicon, 2.6% carbon, with the balance being iron.

Tests Show Ductility, Strength of Alloy

The modified D-2C alloy exhibited excellent notch ductility at −320°F in the Naval Research Laboratory dropweight test in section sizes up to at least 3". The Charpy V-notch impact toughness test for the alloy averaged 24 ft-lb at room temperature, 18 ft-lb at −320°F and 11 ft-lb at −423°F.

At room temperature, the material in the normalized condition has a tensile strength of 74,000 psi, a yield strength of 33,000 psi and an elongation of 45%. At −320°F, the tensile strength becomes 110,000 psi, the yield strength 68,000 psi and the elongation 25%.

Microstructural studies determined that the martensite transition temperature — the point where an alloy loses its ductility and becomes brittle — is below −423°F. Holding specimens at −320°F for 100 hours failed to develop any martensite. Also, none developed under alternate exposure at −320°F and room temperature for 20 cycles.

How Alloy Was Born

The modified D-2C ductile iron was developed from the D-2 and conventional D-2C alloys. D-2 is a high-nickel iron containing graphite in the spheroidal form. Compacting of the graphite from flake form to spheroids, by treatment of the liquid iron with magnesium, removes the planes of weakness normally associated with gray cast iron.

The D-2 alloy has an impact strength of 10-12 ft-lb at room temperature, as measured by the Charpy V-notch test. Presence of carbides detracts from the toughness of the material.

Conventional D-2C alloy was developed to overcome the deficiency in impact strength of the D-2 alloy. By lowering the chromium from 2.5% to 0.5% maximum, the primary carbides were eliminated. Lowering the chromium content has the adverse effect of impairing the stability of the austenite.

To compensate for the lower chromium content, nickel and manganese were raised to

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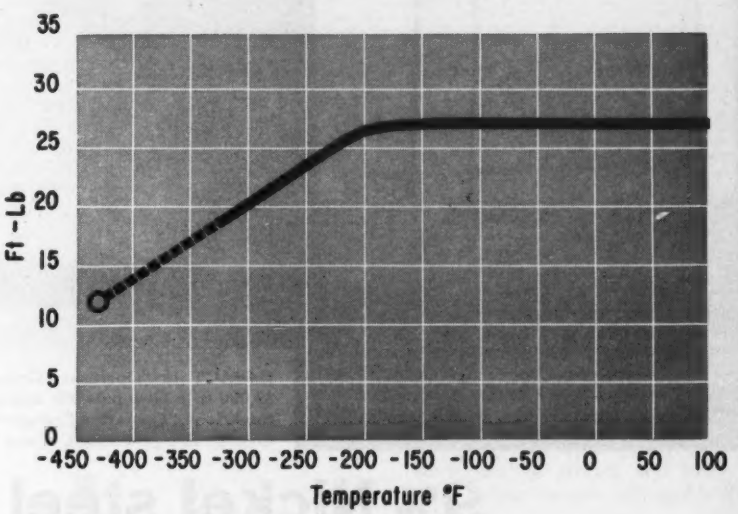
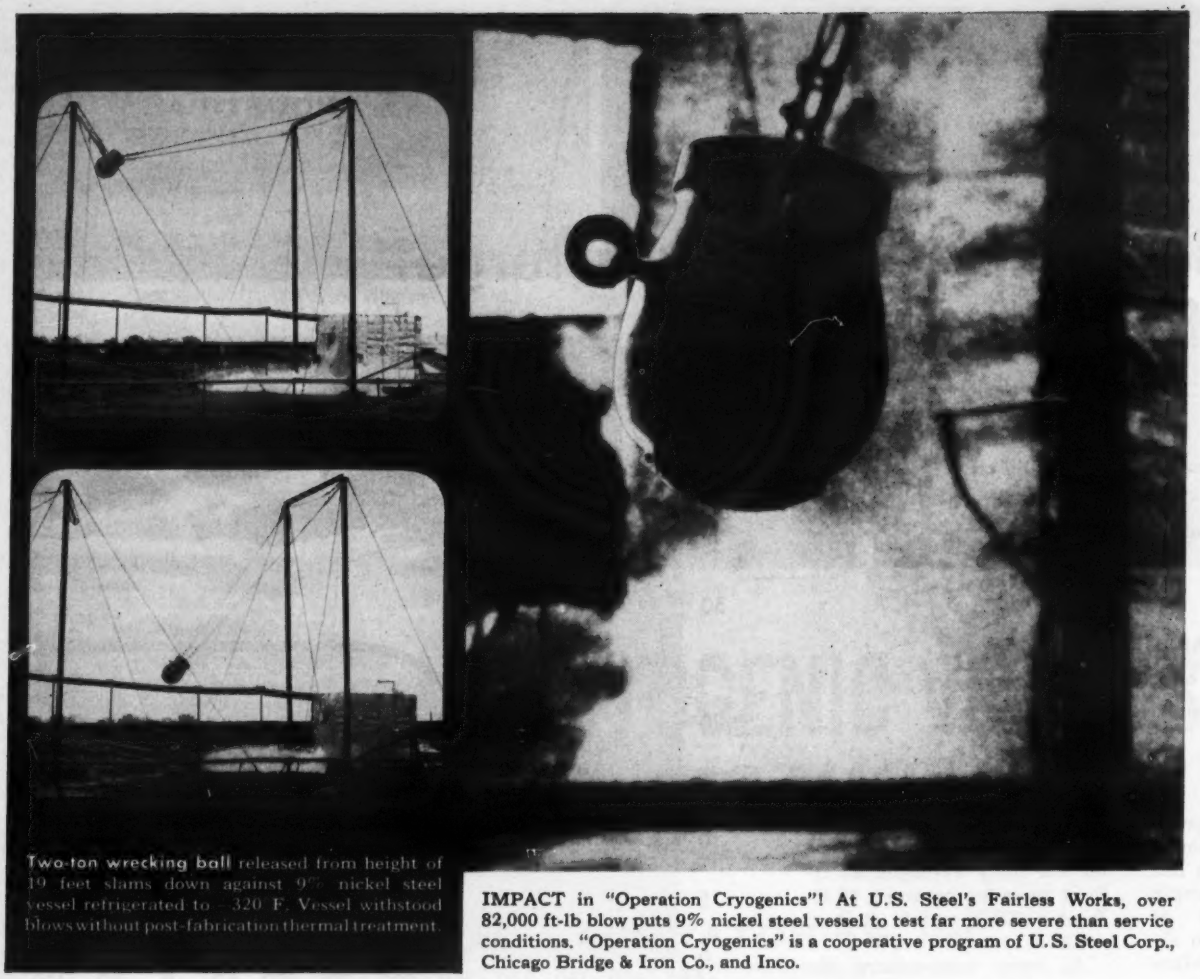
Results of typical Charpy V-notch tests on modified D-2C alloy



EFFECT OF TEMPERATURE ON MECHANICAL PROPERTIES OF MODIFIED NI-RESIST DUCTILE IRON

CONDITION	TEST TEMP. F	TENSILE STRENGTH PSI	YIELD STRENGTH PSI	% ELONG.	MODULUS OF ELASTICITY PSI
NORMALIZED FROM 1700F	70	74,000	33,000	45	17,000,000
" " "	-320	110,000	68,000	25	20,000,000
AS CAST	70	70,000	28,000	42	19,000,000



Two-ton wrecking ball released from height of 19 feet slams down against 9% nickel steel vessel refrigerated to −320 F. Vessel withstood blows without post-fabrication thermal treatment.

IMPACT in "Operation Cryogenics"! At U.S. Steel's Fairless Works, over 82,000 ft-lb blow puts 9% nickel steel vessel to test far more severe than service conditions. "Operation Cryogenics" is a cooperative program of U.S. Steel Corp., Chicago Bridge & Iron Co., and Inco.

9% Nickel steel wins giant hammer test at −320° F

"Operation Cryogenics" proves 9% Nickel steel vessels need no thermal treatment after welding

Imagine the tremendous impact when this two-ton wrecking ball swings down through a long arc and smashes against the steel tank!

Certainly brutal punishment at ordinary temperatures . . .

But in this test the tank was filled with liquid nitrogen and held *at 320 degrees below zero Fahrenheit.*

At this ultra-cold temperature, many materials become brittle and shatter under impact. But steel containing 9% nickel remains tough and ductile. In fact, the yield and tensile strengths of 9% nickel steel actually *increase substantially* as temperature is lowered.

In test after test, the pressure vessels —not thermally treated after welding— withstood massive impacts as high as 82,000 ft-lb.

These tests prove that 9% nickel steel, without thermal treatment after fabrication, provides the high strength and toughness for safe, economical pressure vessels to contain and transport low-temperature liquids.

When you order, design, or build equipment for production, storage, or transport of liquefied gases at temperatures down to −320°F, specify 9% nickel steel for safety and economy. And for engineering data on 9% nickel steel, and other steels for low-temperature service, write to Inco.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

INCO NICKEL
NICKEL MAKES STEEL PERFORM BETTER LONGER

CRYOGENICS

Thermocouples for temperatures to −300°F are among those described for a wide range of temperatures in 12-page bulletin. Other special units can be furnished as required. Form 1-500 — The Claud S. Gordon Company.

Check 4779 opposite last page.

Cryogenic engineering is subject of 662-page book which presents technical papers delivered at 1960 Cryogenic Engineering Conference in Boulder, Colorado. Operating management people in the chemical processing industries can use the book profitably to keep abreast of current research in low-temperature technology. Book was edited by K. D. Timmerhaus of the University of Colorado. "Advances in Cryogenic Engineering," Vol 6, is available at $15 per copy — Plenum Press, Inc.

Check 4780 opposite last page.

Liquid level of cryogenic oxygen, hydrogen, nitrogen and other products can be measured and controlled by means of ultrasonics with units detailed in 30-page booklet AC-1004 — Acoustica Associates, Inc.

Check 4781 opposite last page.

Aluminum applications at low temperatures are illustrated and described in 22-page booklet. Several pages of technical data on various alloys at temperatures to −320°F are included. Form 88-11251 — Aluminum Co. of America.

Check 4782 opposite last page.

Cryogenic pumps for handling fluids such as liquid nitrogen at −320°F or products with still lower boiling points are described and illustrated in brochure. Units can handle volumes to 15,000 gpm and pressures to 2000 psi. Mechanical seal for use with cryogenic fluids is discussed. "Standardized Cryogenic Pumps" — Byron Jackson Pumps, Inc.

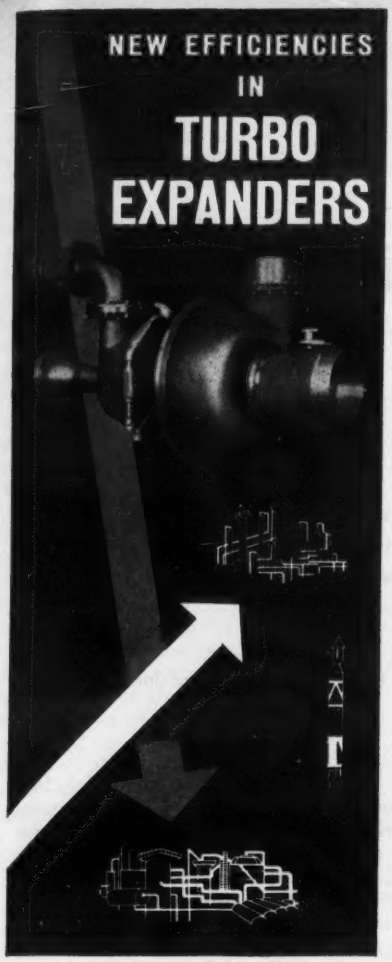
Check 4783 opposite last page.

Environmental equipment for variety of research, storage and production operations at low temperatures is described in 12-page Bul 103 — Cincinnati Sub-Zero Products Company.

Check 4784 opposite last page.

Liquid nitrogen food freezing and transport systems which eliminate need for conventional refrigeration, provide economy and retain product quality, are described and illustrated in 16-page brochure — LiqueFreeze Corporation of America.

Check 4785 opposite last page.



For Gas Liquefaction

Compact turbo-expanders by STRATOS have brought a new level of efficiency in turbo machinery for the chemical and petro-chemical industries. For many new Hydrogen, LOX and ammonia plants, Stratos equipment is specified.

Why STRATOS' units? They're compact and efficient and have demonstrated that they can be kept on stream continuously for over a year on end. Complete thermo-aerodynamic studies made for each application permit efficiencies as high as 86%. Behind each design is 20 years service-proven engineering experience in high speed, maximum performance turbo-machinery—turbo-expanders for cooling gases down to almost absolute zero, for temperature reduction in continuous flow chemical processes, for power recovery from gas streams, and for use in mobile electrical power plants operating with nuclear fuel.

For detailed information or technical literature, write—

STRATOS®
A DIVISION OF
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Bay Shore, L. I., N. Y.

Check 4786 opposite last page.

Cryogenic insulation

From page 30

tank and the required piping and transfer lines of the inner vessel must be designed to reduce to a minimum the amount of heat leak from outside. As shown by Table II,

TABLE II

Cryogenic Construction Materials

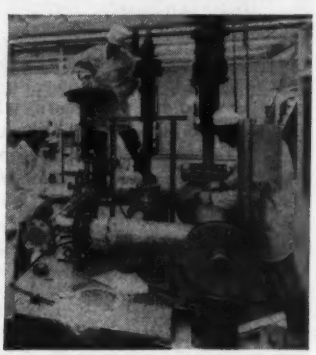
Metal	Thermal Conductivity at 100°K (Watts CM^{-1} $°K^{-1}$)*
Copper	4.00
Aluminum	3.00
Brass	0.46
Monel	0.20
Inconel	0.12
Stainless	0.08

*It is customary to use watts for conductivity of cryogenic metals. For converting to Btu/hr/sq ft/°F/ft, multiply by 57.79.

stainless steel has the lowest conductivity and is the most adequate for supports and transfer lines with a minimum heat leak. ■

Stainless steel fittings handle propellants

High-pressure, stainless steel fittings and pipe are installed in a propellant loading system in a 150′-deep underground missile silo. All piping had to be cleaned more thoroughly



than hospital operating room to avoid a premature explosion of liquid oxygen and other propellants.

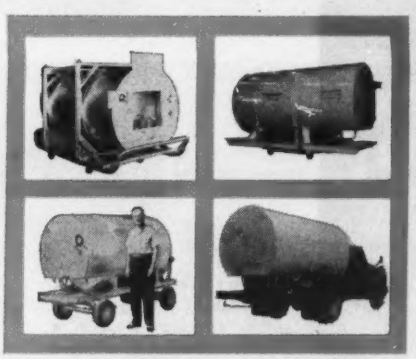
(Stainless fittings are product of Forge and Fittings Div., H. K. Porter Co., Inc., Roselle, New Jersey.)

Check 4787 opposite last page.

Now... a Complete Line of Ronan & Kunzl *Cryotainers*®

Cryotainer Model 54
New portable, self-emptying liquid nitrogen container, caster-mounted with one locking caster. Self-contained pressurizing device facilitates liquid nitrogen or oxygen flow. Has liquid level gauge and pressure gauge. For laboratories, artificial inseminators, fast-freeze experimenters.

- Choice of models from 54 to 2,000 gal. capacity
- Vacuum and powder insulated
- Factory Service Tested
- More than 2,500 units in service



Ronan & Kunzl offers a wide range of models and sizes of cryogenic containers for storing and transporting liquid oxygen, nitrogen and argon.

Cryotainers are distinguished by low evaporation rate, extremely low vacuum loss, and positive pressure relief protection. **All models are service-tested at the factory before shipment.**

Over a decade of cryogenic experience provides you assurance of Cryotainer's high efficiency and safe operation.

A wide range of mounting options are available as illustrated at lower left.

Write or phone for specifications and prices.

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Cryogenic Division
RONAN & KUNZL, INC., MARSHALL, MICHIGAN
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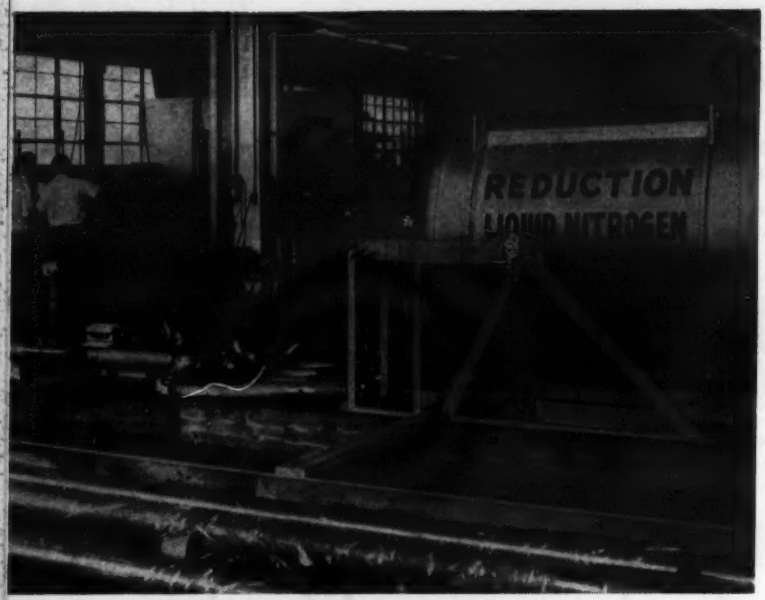
INDUSTRIAL CRYOGENICS

Industrial nitrogen production seen doubling by 1965



▲ Liquid nitrogen is used to test cryogenic piping

◀ Apples can be sold throughout the year when they are kept fresh in a sealed chamber of nitrogen at reduced temperatures

Increased use as a super-cold liquid for refrigeration and as an inert gas are major factors in rapid growth

By **GEORGE HOWE,** Air Reduction Company, Inc.

ACCORDING to official U.S. Government sources, production of high-purity industrial nitrogen totaled 12 billion cu ft in 1960, as against 9.5 billion in 1959 and 1.3 billion in 1950. It is estimated that production in 1965 will hit 25 billion cu ft, more than double the 1960 rate.

These government figures do not include the large quantity of nitrogen—a portion of which is obtained from the separation of air—that is used to produce synthetic ammonia. Synthetic ammonia capacity, most of which is used for fertilizers, will increase 50% by 1965, according to estimates. Also, the government figures do not include the nitrogen produced by combustion in inert-gas generators. This nitrogen is used for blanketing operations where trace impurities are of no consequence.

Many blanketing operations in certain chemical processes require the high-purity, cryogenically-produced industrial nitrogen, which is one reason for its phenomenal growth.

Another reason for the rapid expansion in industrial nitrogen is its increasing use as a super-cold liquid at −320°F for refrigeration and a variety of other applications.

Largest consumer of industrial nitrogen is the chemical industry, which accounts for about 40% of the total. Of the remainder, 20% goes for electronics, 10% for aircraft production, 6% for petroleum refining, 5% for rockets and missiles, 4% for public utilities, 2% for food processing and 13% for a number of other applications. Outlook for the future is for nitrogen use in chemicals, electronics and food processing to grow the most rapidly.

Major portion of industrial nitrogen is manufactured by separation of air into its components by cryogenics. Oxygen and nitrogen are the principal products produced. A 400-ton-per-day oxygen plant could produce about 1000 tpd of nitrogen in gaseous form without adding much to capital cost. If more nitrogen is desired, however, increased capital expenditures for equipment are required. Also, if nitrogen is desired in the purer, liquid form, added refrigeration equipment is necessary.

Liquid Nitrogen Requires Less Space

Liquid nitrogen is becoming increasingly popular because

696 times as much can be stored as a liquid in the same space as would be needed for the gaseous form at atmospheric pressure.

When liquid nitrogen is converted to a gas, it can exert great force without need for moving parts. Airco makes use of this principle in a piece of equipment it manufactures — a high-pressure filling system.

The fact that nitrogen occupies so much less space as a liquid than as a gas is also a factor in reducing transportation costs. Even if gas is compressed to 300 psi, an equivalent weight would still occupy about 30 times as much space as a gas than it would as a liquid.

Air Reduction maintains a fleet of five different types of insulated trailers for liquid nitrogen. Some of these have an interior tank of 304 stainless steel and an outer tank of carbon steel. Most are of all-aluminum construction.

Capacities of storage equipment at user locations range from 15 to 15,000 gal. Larger stations can be installed if warranted by volume used. The liquid nitrogen is used for blood preservation, shrink fitting of metals, cooling and a wide variety of other applications.

Chemical processes requiring low or cryogenic temperatures often make use of a refrigeration system in which temperature reduction is produced by evaporating liquid nitrogen, with accompanying heat absorption. One such process is the extraction of semi-conductor metals from raw ore. Certain steps in the extraction process are more efficient at cryogenic temperatures.

The low temperature of liquid nitrogen is also called into action in the storage of liquid helium. This intensely cold liquid, whose temperature is within a few degrees of absolute zero, is frequently stored in a chamber surrounded by alternate buffer layers of vacuum and liquid nitrogen. Liquid fluorine is transported in a trailer having a chamber surrounded by

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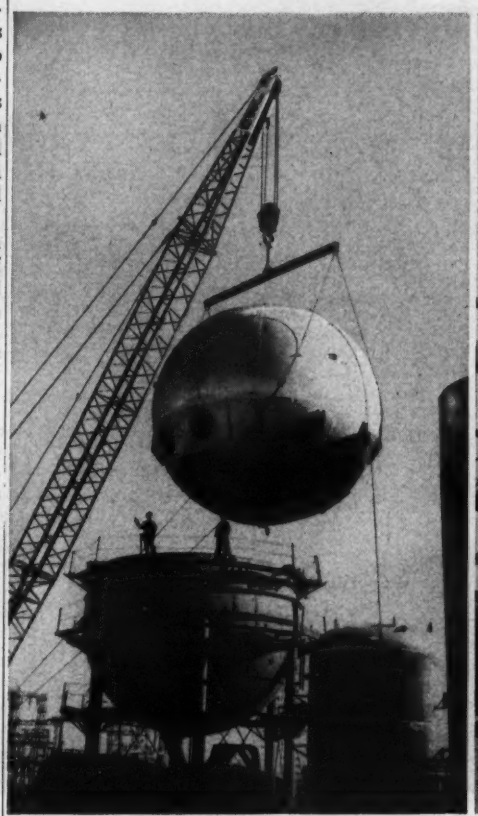
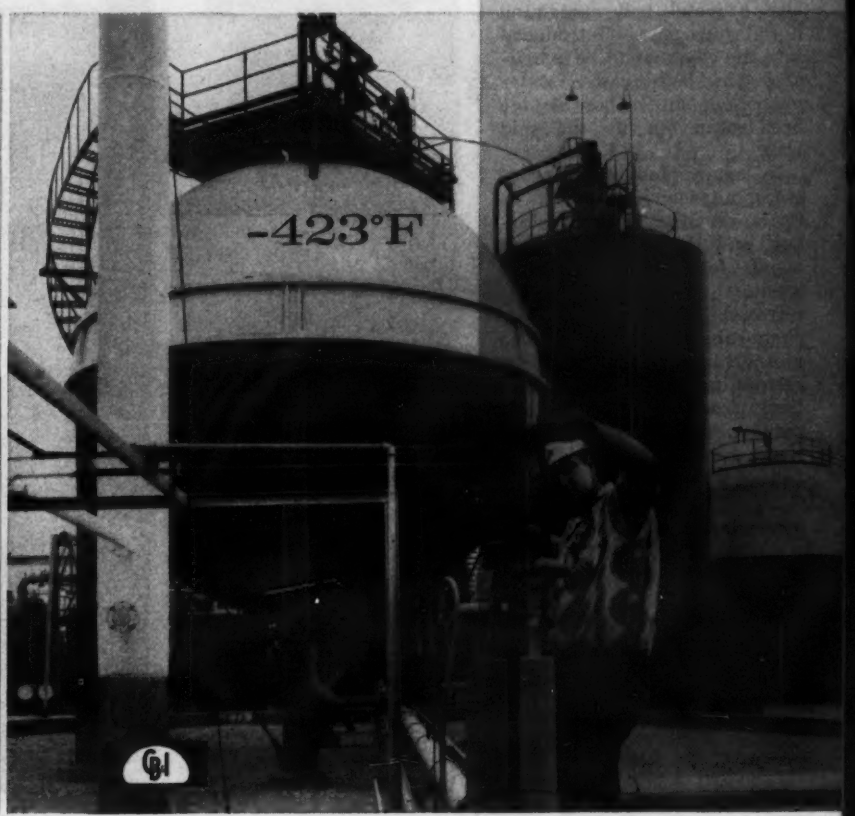
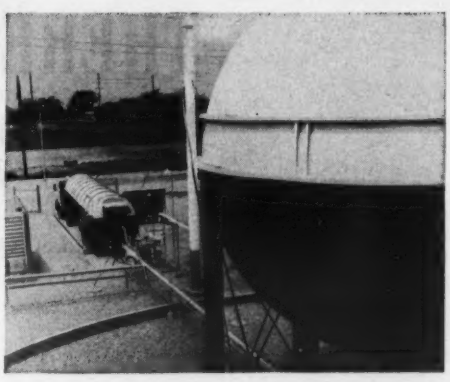
First privately owned and operated space-age plant furnishes liquid hydrogen to missile centers and industrial users

NITROGEN
HYDROGEN





These double-wall cryogenic storage tanks play a vital role in the first privately-owned plant to supply liquid hydrogen on a large-scale commercial basis. Hydrogen is stored in the sphere at –423°F and nitrogen in the cylindrical tank at –320°F. Located in Torrance, Calif. and owned by Linde Company, Division of Union Carbide Corporation, the plant will deliver 3,300,000 lbs. of liquid hydrogen yearly to missile centers. Both tanks were designed (using Linde-approved designs), fabricated and erected by CB&I, world's most experienced builder of cryogenic vessels.



ABOVE: Aluminum inner shells and carbon steel outer shells were used for the two cryogenic tanks. The spherical tank is 28 ft. in diameter and the cylindrical tank 21½ ft. Special insulation is between the shells.

TOP LEFT: The inner sphere is suspended in the outer sphere by stainless steel rods positioned around the perimeter. Resting on the ground nearby is the aluminum inner shell of the cylindrical nitrogen tank.

LEFT: A trailer is being loaded with liquid hydrogen for delivery to missile centers, other government installations, or industry.

CB&I

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From preceding page

liquid nitrogen and insulation on the outside.

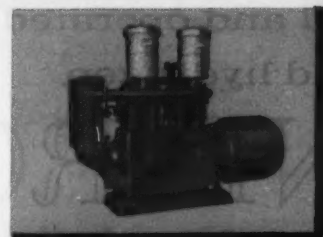
A number of industries use liquid nitrogen in cold traps, used in vacuum-pump systems for high-degree evacuation of equipment. Two general methods are used. The air to be evacuated is either drawn through a coil immersed in liquid nitrogen, or else a metal ball containing liquid nitrogen is introduced into the chamber to be evacuated. In both cases, water vapor, oils and carbon dioxide are frozen out by the cold trap.

In many industrial processes, nitrogen is retained in its liquid form only for storage, and then expanded into a gas for use. Perhaps the greatest quantity of gaseous nitrogen consumed in the chemical industry is used as an inert atmosphere to blanket certain processes and protect them from contamination by oxygen. Often this atmosphere has the additional feature of being a safety measure, since it eliminates potentially hazardous conditions.

An inert nitrogen atmosphere is also used in oil fractionating, where it is used to purge and pressurize reactors associated with certain distillation processes whenever the catalyst is reactivated. Nitrogen used under conditions of high pressure and flow is becoming increasingly useful in oil well drilling operations.

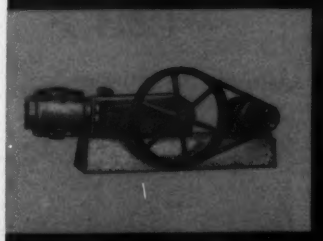
Gaseous nitrogen is also used by various chemical processors as a raw material in the production of chemical compounds of industrial value in addition to the use in ammonia manufacture. Cyanamide is produced by reacting nitrogen with calcium carbide. Nitrogen also appears as a basic material in the production of nitrogen oxides and hydrazines, both used in the production of missile propellants.

Many pharmaceuticals contain elemental nitrogen, especially vitamins such as riboflavins and nicotinic acid, as well as proteins, enzymes and sulfa drugs. Liquid nitrogen is often used as a source of nitrogen for these products,



Class P, single-acting, air-cooled; capacities to 554 cfm.

Class Y, double-acting, water-cooled; capacities to 2050 cfm.



Class T, double-acting, water-cooled; capacities to 688 cfm.

Class H, 4-corner, double-acting, water-cooled; capacities to 10,000 cfm.

plant air

One of four 800 hp Class O-CE Compressors serving a large steel mill. Capacities to 6,000 cfm.

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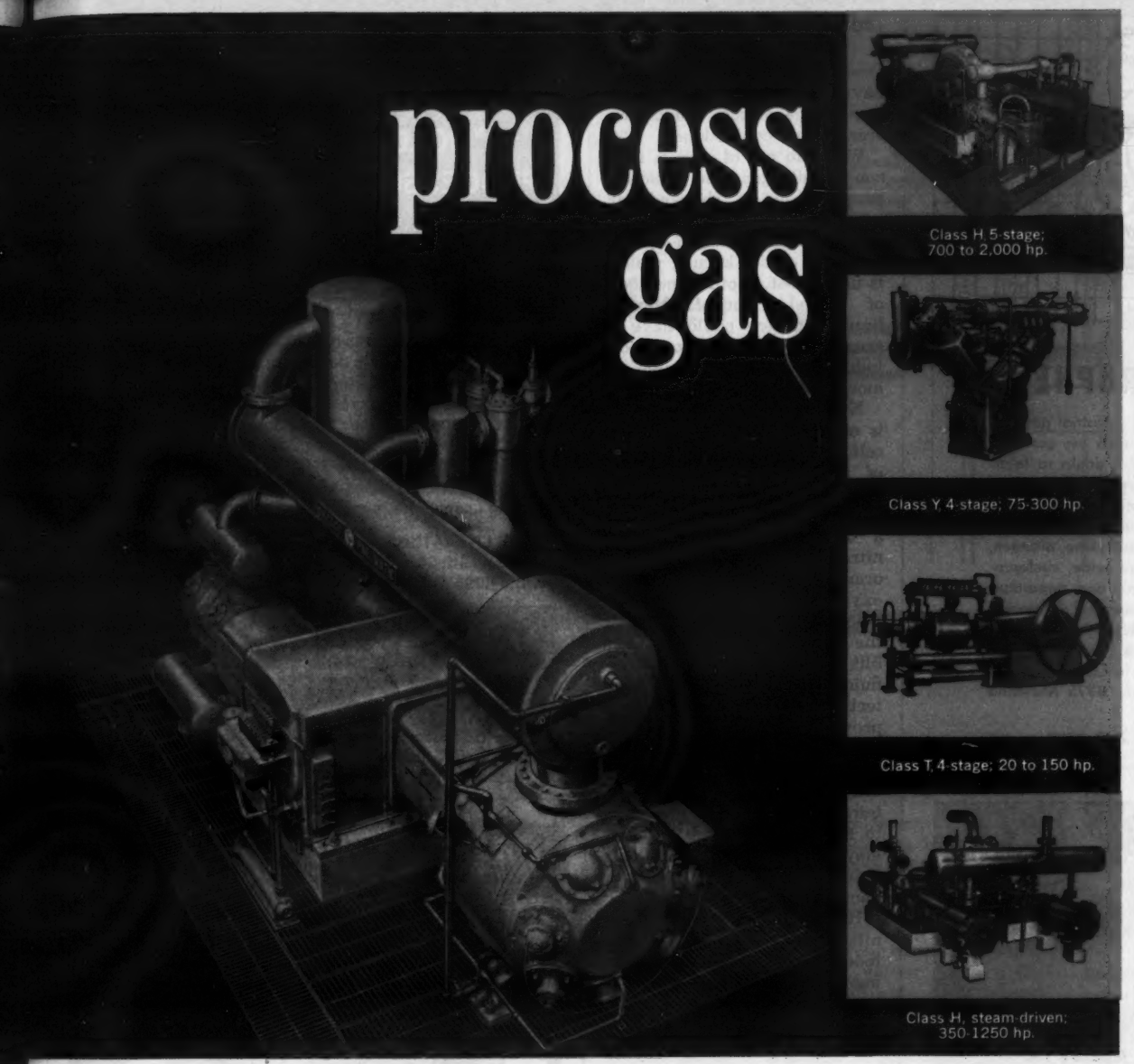
There's a Chicago Pneumatic Compressor to meet every demand for general plant air. And, in process work, CP Compressors are handling most known gases with special regulation and other features tailored for each job, and with lubricated or non-lubricated cylinders. For full information write: *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*



Class H, 5-stage; 700 to 2,000 hp.

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Class H, steam-driven; 350-1250 hp.

Class FE-33 horizontal, balance-opposed, 3-throw, 3-stage gas compressor. Sizes 250-5,000 hp.

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Check 4790 opposite last page.

particularly in cases where high purity is an important factor.

Liquid nitrogen may have its greatest impact on the food industry — in processing and transportation. For example, food can be frozen in a few minutes by injecting liquid nitrogen into its shipping container whereas normal refrigeration requires an hour or more.

Liquid nitrogen may also take the place of other methods of refrigeration in railroad cars and trucks. If food is subfrozen with liquid nitrogen at −320°F, it may be transported in an insulated container with no other means of refrigeration. Food will still be at preferred low temperature when it reaches its destination. Successful shipments have been made this way for periods of up to 45 days.

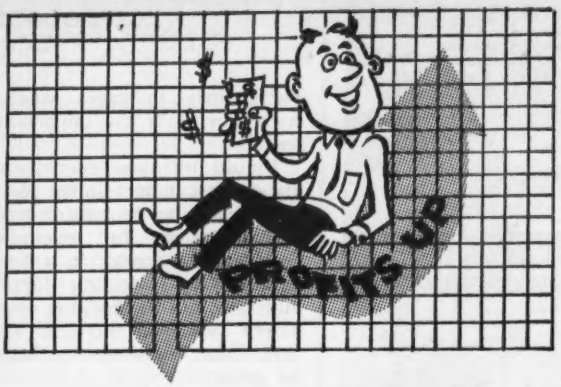
Another method is to spray a blast of liquid nitrogen into an insulated truck or railroad car, either before sealing or automatically during transportation whenever the temperature reaches a certain level. Carbon dioxide is already in large volume usage for this type of application. Heat exchangers, in which nitrogen is expanded from a liquid to a gas, appear to offer an efficient means of utilizing the refrigeration available from liquid nitrogen.

Another development which holds great promise is the use of a liquid nitrogen bath for quick freezing of food stuffs such as fresh tomatoes that cannot be successfully frozen by conventional methods, which tend to rupture cell walls and cause loss in product quality and appeal.

An unusual application of nitrogen is the freeze-separation process. When a peeled orange or grapefruit is dipped into a bath of liquid nitrogen, it freezes instantly and can be made to shatter into thousands of tiny juice cells, which can then be preserved and transported in their frozen state[1]. Once these cells are in commercial production, they will

To next page

[1]See article in FOOD PROCESSING, June 1961 issue, page 48



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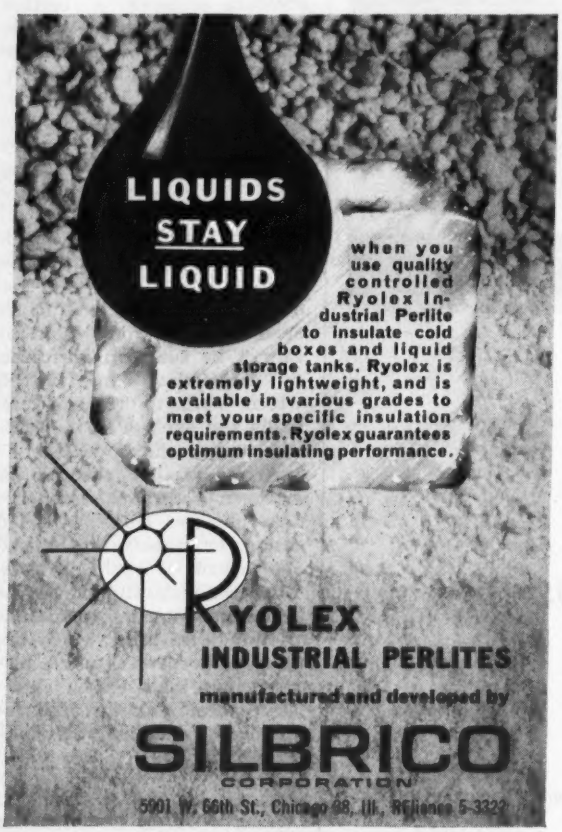
Check 4791 opposite last page.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when you use quality controlled Ryolex Industrial Perlite to insulate cold boxes and liquid storage tanks. Ryolex is extremely lightweight, and is available in various grades to meet your specific insulation requirements. Ryolex guarantees optimum insulating performance.
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Check 4792 opposite last page.

Industrial nitrogen

From preceding page

have a marked effect on the appearance of soft drinks, ice cream and confections.

When an ear of corn is frozen in nitrogen, the separate kernels can be shucked off whole. This process retains the important "vitamin tip" at the base of the kernel, which is usally lost in other methods of kernel removal. Hence, liquid nitrogen could have a great effect on the frozen food industry, which has sales of more than $2 billion per year.

Nitrogen in its gaseous form is making a new place for itself in food processing because of its inertness. A sparging process, developed by Air Reduction, makes it possible for a manufacturer to entrain nitrogen into a liquid such as orange juice, thus forcing out oxygen and retaining quality. Once the juice is packaged, the entrained nitrogen also fills the head space over the fluid, acting as an added protection. This process has proved successful in the processing of a number of fluids, including fruit juices, essential oils, wine, liquid sugar, and tomato puree, and is also used to fluff heavier foods such as mayonnaise to make them lighter, bulkier and easier to handle.

Hence, the 2% of industrial nitrogen currently used in food processing is expected to increase to a considerably larger percentage by 1965. ■

Thermometer specifically designed for liquid oxygen or hydrogen service are described in eight-page technical bulletin. The platinum-resistance temperature sensors have an accuracy of ±0.1°F down to −435°F. Bul 2000 — Trans-Sonics, Inc.

Check 4793 opposite last page.

Ball valves in sizes from ¼" up to 10" for cryogenic applications such as liquid oxygen are described in data sheets — Koehler Aircraft Products Company.

Check 4794 opposite last page.

Gas separation, gas purification and gas liquefaction technology is discussed by company building plants for processing of gases at low temperatures. "Cryogenics" — American Messer Corp.

Check 4795 opposite last page.

The secret is **continuous** bulk flow operation — far faster and more efficient than batch processing. Heating or cooling fluid circulates through the hollow shaft and flights of a conveyor screw, thus processing granulars, fluids, or sludges as they flow along. Gentle conveying action minimizes particle degradation and dusting. Broad operating range. Heats to 500°F; cooling range, 1800°F to 0°F. Multiple "Holo-Flite" tiers can be stacked for high capacities in minimum floor space.

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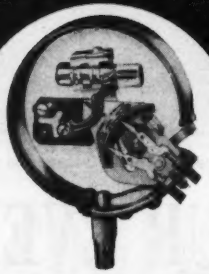
WESTERN PRECIPITATION

Check 4796 opposite last page.

MERCOID PRESSURE CONTROL

equipped with **316 Stainless Bourdon Tube**



Series D-41, 243, 541

316 stainless steel welded Bourdon tube. ¼" (316) stainless steel pressure connection. Nickel plated mechanism. Outside adjustments. Calibrated dial. Hermetically sealed mercury contact.

Operating ranges: 30" vac.-75 psig; 10-100 psig; 30-400 psig; 75-800 psig. and 100-1000 psig.— with varying differentials and electrical capacity to meet your application.

WRITE FOR BULLETIN 619

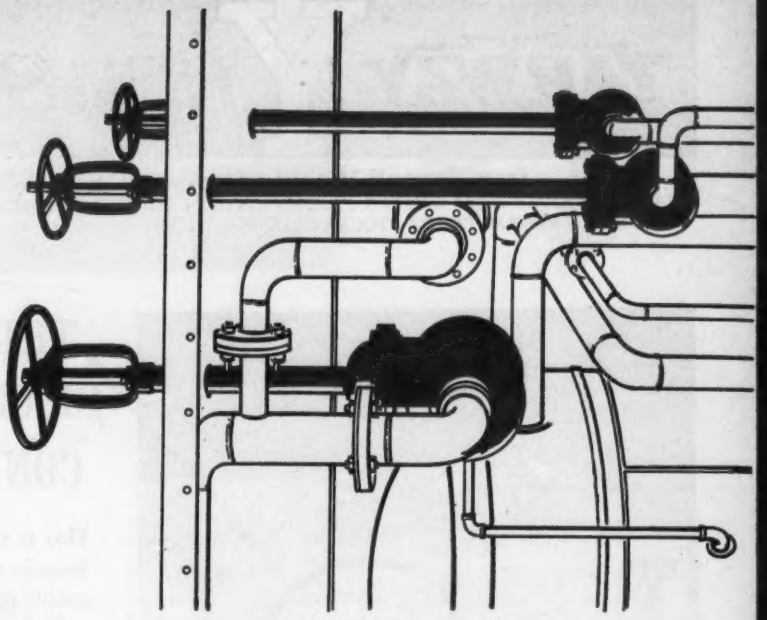
THE MERCOID CORPORATION
4201 Belmont Ave., Chicago 41, Ill.

Check 4797 opposite last page.

INDUSTRIAL CRYOGENICS

Extended-bonnet valves withstand thermal shock

More than 100 stainless units are subjected to cycling between 200°F and −320°F in oxygen plant, which is expected to operate two years or longer before a shutdown is required



Valves connect to piping inside cold box, which is ready to be filled with rock-wool insulation

Employee examines extended-bonnet, six-inch gate valve ready for installation at Mingo Oxygen

ONE of the major factors in the successful operation of a 400-tpd oxygen plant placed on stream in January 1961 was the careful selection of valves for the process. Among considerations governing choice were: 1) valve construction material that would remain ductile at low temperatures and minimize heat flow into cold boxes from outside, 2) operational safety, 3) ease of maintenance, and 4) gasketing that resists low temperatures.

Mingo Oxygen Company, the firm that utilizes the valves, is located at Mingo Junction, Ohio. The new plant is jointly owned by Wheeling Steel Corporation — the company that will use 400 tpd of the oxygen — and Hydrocarbon Research, Inc. — the company that designed and constructed the plant.

In addition to the 400 tpd of gaseous oxygen that is used by Wheeling Steel, the plant will also manufacture for sale more than 20 tpd of liquid oxygen, as well as 6.5 tpd of liquid argon.

More than 100 special extended-bonnet valves, which cost in excess of $100,000, are used in the $6 million oxygen plant. Valves were designed to withstand temperatures down to −320°F, the boiling point of liquid nitrogen, and pressures to 600 psi.

Hydrocarbon Research specified 304 stainless steel as the valve construction material that would meet the requirements. Type 304 stainless has an approximate Charpy impact value of 57 ft-lb at −320°F, well above the ASTM minimum requirement of 15 ft-lb.

In addition to being able to resist temperatures down to −320°F, valves are subjected to temperature changes from +200°F to −320°F in only three or four minutes. The 304 stainless valves have been found well able to withstand this thermal shock.

Another advantage of 304 stainless in this application is its low thermal conductivity, five Btu/hr/sq ft/°F/ft at −320°F. Because of this, the valves resist heat flow, thus reducing heat leak into the two cold boxes used in the plant.

Valves were specified with stems of varying lengths so that bonnets, stuffing box and handwheels could be extended to the outside of the cold boxes. This facilitates operation of valves and makes them easily accessible for maintenance. Chevron-type molded Teflon is used in the stuffing boxes of all low-temperature valves.

Valve gasketing, which is also Teflon, is inside the cold box and is subject to the extreme cold. Teflon is able to withstand temperatures of −320°F or less.

At the wall of the cold box, the stem of each extended-bonnet valve emerges through a flexible boot or bellows seal. This flexible seal is clamped by stainless straps to a steel collar around the opening in the wall and to split wooden blocks around the valve stem itself. Bellows action of the flexible seal takes up contraction or expansion of the pipeline.

Safety Is Paramount In Design Of Plant

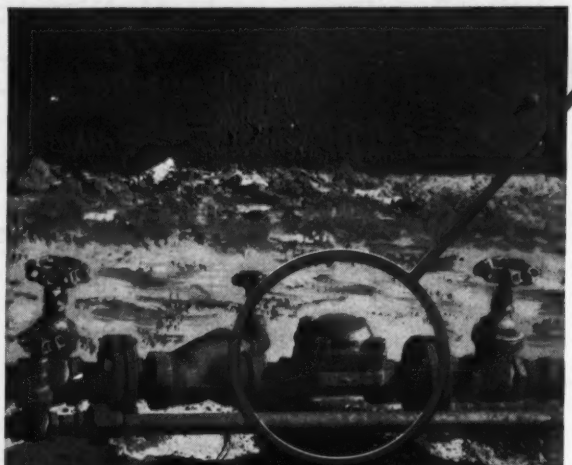
Safety was a prime consideration in design of valves as well as the other equipment in the plant. This is another reason that stainless was selected. Stainless has less surface porosity than some other metals and therefore has a greater cleanability. Also, it is chemically less active than some other alloys commonly used for cryogenic service and therefore less subject to corrosion from minute impurities in gases being handled.

To next page

YARWAY Y news-briefs

from **Yarnall-Waring Company,** *Philadelphia 18, Pa.*

BRANCH OFFICES IN 19 UNITED STATES CITIES • SALES REPRESENTATIVES THROUGHOUT THE WORLD • STEAM TRAPS STOCKED AND SOLD BY 270 LOCAL INDUSTRIAL DISTRIBUTORS



THIS STEAM TRAP WILL DISCHARGE 25,500 LBS. OF CONDENSATE PER HOUR

This is a typical installation of a Yarway Series 40 Impulse Steam Trap—a trap designed specifically to gobble up extra heavy condensate loads.

The trap is a No. 48, 2½" size, and is installed on a suction heater connected with an 86,000 barrel tank containing fuel oil at a storage terminal. The operating pressure is 13 psi. At this pressure the trap has a capacity of 25,500 lbs. continuous discharge of condensate per hour.

At operating pressure of 100 psi, the trap's capacity is 62,000 lbs. per hour.

CAPACITY—PLUS

Capacity isn't the whole story on Yarway Series 40 Steam Traps. Like all Yarway Impulse Traps, they offer advantages like quick heat-up, even temperatures, small size, good for all pressures, non-freezing.

Series 40 traps also feature high temperature discharge characteristics, excellent low pressure operation, no airbinding, operation against back pressures up to 40%, and stainless steel construction.

You can get Yarway's latest steam trap Bulletin T-1743, or arrange for a free 60-day trial of a Yarway Impulse Trap, by writing to Yarnall-Waring Company or contacting your local Industrial Distributor.

Yarway ½" No. 40 Impulse Steam Trap (shown actual size). Also available in ¾", 1½", 2" and 2½" sizes.

YARWAY OFFERS IMPULSE STEAM TRAPS FOR THESE SPECIFIC OPERATING CONDITIONS

AVERAGE CONDENSATE LOADS	EXTRA HEAVY CONDENSATE LOADS	LIGHT CONDENSATE LOADS
Series 60	Series 40	No. 30

Check 4798 opposite last page.

Extended bonnet valves

From preceding page

The manufacturer cleaned all valves in an air-conditioned room supplied with filtered air maintained above atmospheric pressure so that flow was out of room. Tools which might produce dust or chips were banned. Workers wore special clothes, including nylon overshoes, which produce no lint. Wiping rags were also of lintless material.

Valves were scrubbed and brushed in solvent, in acid and finally in deionized water. They were examined under a black light and wiped with a special white paper to see if anything was picked up. After a second washing with deionized water, valves were dried by infrared, sealed and packaged.

Among other design features of the valve are two-piece gland construction — to prevent scoring of stem — and an extra-deep stuffing box. The yoke nut can be replaced without disassembling the valve. Sizes used by the plant range up to 10". The larger ones are gate valves; the smaller ones (for throttling) are globe valves.

Valves handle air, oxygen, nitrogen and argon in liquid and gaseous forms. Stream velocities are in order of 50 to 65 feet per second. Some of the gate valves handle Freon used for refrigeration system at temperatures to −125°F and pressures to 200 psig. The main refrigeration system uses nitrogen, with waste nitrogen expanded through turbo-expanders.

Special Couplings Utilized In plant

Although stainless is used for valves and some lines, aluminum is also extensively used for lines and some other equipment.

A special coupling, developed by Hydrocarbon Research, is used to join aluminum lines to stainless lines by welding directly to the coupling, thereby eliminating flanges. The coupling is made of aluminum and stainless.

The plant has operated well since it was placed on stream the first of this year. Valve

performance has been up to expectations. No maintenance has been necessary except for tightening of external packing-glands after "cool down." This is a normal procedure necessitated by the shrinkage which occurs when the extremely low operating temperatures are reached for the first time.

(Extended-bonnet valves are a product of Cooper Alloy Corporation, Valve & Fitting Div., Hillside, N.Y.)

Check 4799 opposite last page.

Calcium silicate insulates liquid H_2 tankcars

Finely divided powder has low k value

During the last few months a large number of liquid hydrogen tankcars have been successfully insulated with Micro-Cel T-4, which consists of synthetic calcium silicate. The insulation — a finely divided, free-flowing powder — was placed in the evacuated annular space of the tankcars. Material has also been advantageously used for storage of liquid hydrogen.

Micro-Cel T-4 has k value of about 5 microwatts/cm °K at a pressure of 10^{-2} mm of Hg and temperature range of 300 to 20°K (liquid hydrogen temperature).

Insulation contains 4 to 7% moisture as received and must be dried before being placed in evacuated annular space. Material is also suitable for use at atmospheric pressure for such products as liquid nitrogen.

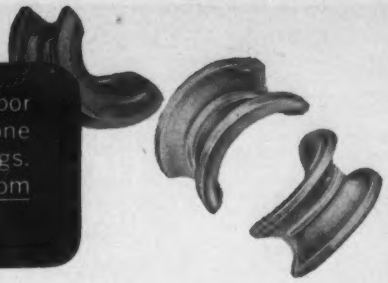
(Micro-Cel T-4 is manufactured by Johns-Manville Products Corporation, Celite Div., 22 East 42nd St., New York 16, N.Y.)

Check 4800 opposite last page.

Containers called, Cryotainers, in sizes from 50 to 2000 gal, for handling cryogenic products such as liquid oxygen, nitrogen and argon are covered in brochure. "Cryotainers" — Ronan & Kunzl, Inc.

Check 4801 opposite last page.

THE QUESTION:



"We are operating at a reflux ratio of 1:1 with a vapor velocity of 4 feet per second. The system is acetone and water. Packed depth is 30' of porcelain raschig rings. How many more transfer units can I get if I switch from 1" raschig rings to Intalox saddles?

This question is typical of those which can be answered by referring to the data appearing in U. S. Stoneware's Engineering Manual on Packed Towers . . . data reflecting the results obtained from our continuing research into the mechanics of packed tower operations, conducted in our experimental towers in our laboratories in Akron.

THE ANSWER:

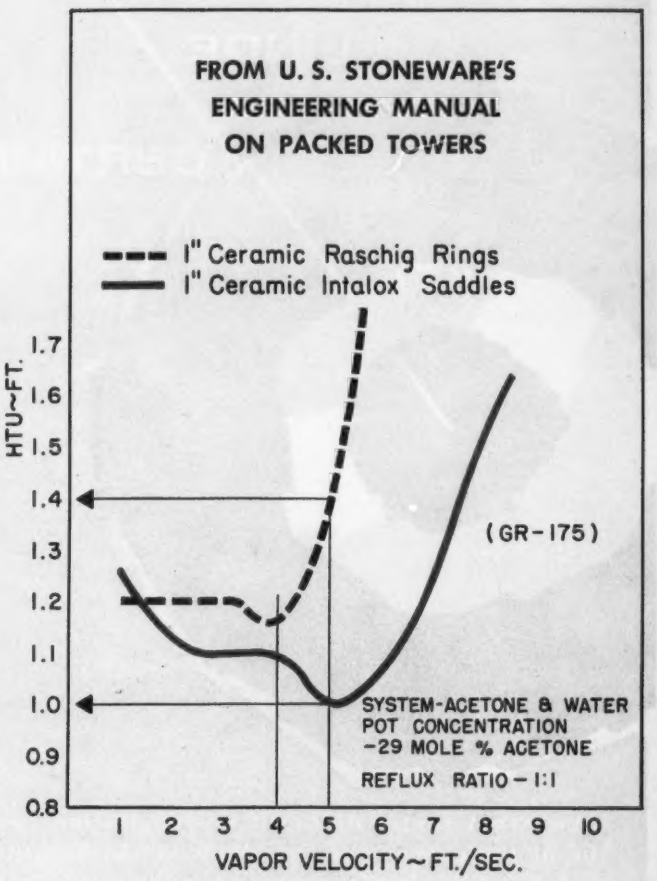
The curves in the chart at the right reflect the performance of 1" ceramic raschig rings and 1" ceramic Intalox® Saddles in a series of test runs in our experimental towers with the system: Acetone and water.

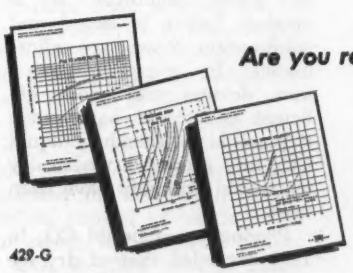
As you will note, the lowest HTU for raschig rings (about 1.17 ft) is developed at the 4' per second velocity specified in the question. While the HTU for Intalox Saddles at the same vapor velocity is somewhat lower (1.10 ft), the difference is hardly enough to warrant the higher cost of Intalox Saddles.

However, at 4' per second, the raschig ring packed tower is operating dangerously close to flooding as evidenced by the rapid increase in HTU with only a slight increase in vapor velocity. Practically, vapor velocity should be held between 3' and 3½' per second for an HTU of approximately 1.2'.

But, a changeover from ceramic raschig rings* to ceramic Intalox Saddles would do this: *it would permit an increase in vapor velocity to 5' per second for an HTU of 1 foot. This would mean a 20% increase in the number of transfer units and a profitable 30% increase in operating capacity.*

**Whether the change is made or not, it would be best to split the 30' bed into two 15' beds to obtain optimum performance.*





429-G

Are you receiving these reports?

We'll be glad to place your name on our list to receive these reports on packed tower performance as they are released. Write, on your letterhead, Engineering Dept., U. S. Stoneware, Akron 9, Ohio.

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Check 4802 opposite last page.

chemical processors!

An over-the-fence oxygen plant will deliver nitrogen as well with

LINDE CERTAINTY

CERTAINTY that, with LINDE design, the one need not be at the expense of the other. CERTAINTY that the same standards of purity and volume can be maintained consistently. CERTAINTY that the latest advances in automated control will guarantee maximum efficiency throughout the process.

UNION CARBIDE

Check 4803 opposite last page.

INDUSTRIAL CRYOGENICS

Cryogenic cooling aided by CO_2

One reason for continued growth of carbon dioxide is its ease of handling in liquid form

By C. E. WOLFE, Vice President
Cardox Division of Chemetron Corporation

ALTHOUGH the lowest temperature of carbon dioxide, −109.6°F, is above that usually attributed to cryogenics, the material still plays an important role in cooling to temperatures below this figure. Carbon dioxide can be employed as a low-cost coolant to bring materials down to approximately −100°F where the ultra-cold liquids take over.

One reason for the continued growth of carbon dioxide as a refrigerant is its ease of handling in liquid form. In this state it is more easily controlled and metered. It can be piped wherever it is needed. Labor is saved and sublimation losses are eliminated. In many instances, new devices and more efficient equipment have made it possible to introduce liquid CO_2 into processes where dry ice would normally have been used.

Production of liquid CO_2 in 1960 exceeded that of dry ice for the first time. Last year 481,371 tons of liquid CO_2 and 469,505 tons of solid were produced in the U.S.[1] Hence, 51% of total production of 950,876 tons was in liquid form.

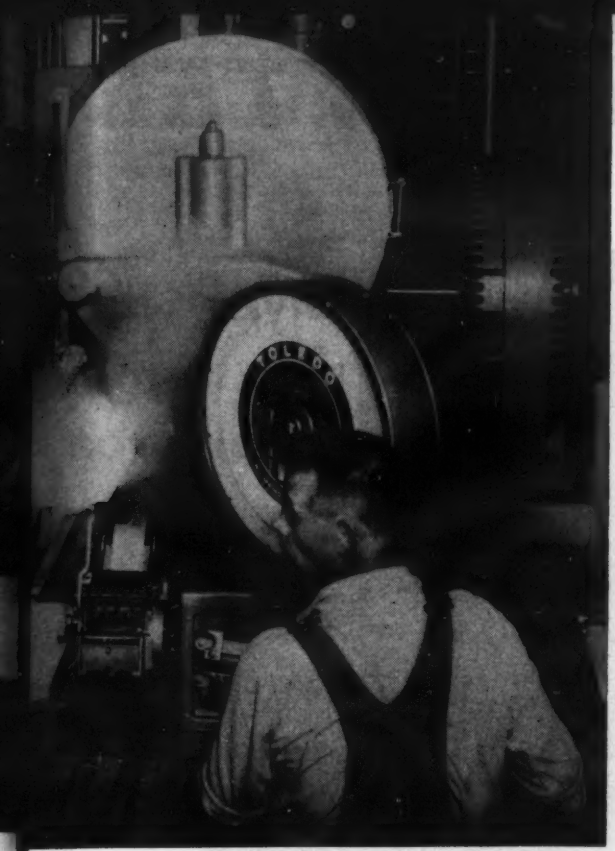
This can be compared to 1955 when 204,170 tons of liquid and 572,583 tons of solid were produced. Of the total production of 776,753 tons, 36% was in liquid form.

By 1970 total production of CO_2 will be 1,250,000 tons and 75% of this will be in the liquid form, according to estimates.

Liquid will never replace dry ice for some applications, however. Solid CO_2 will continue to be popular as a refrigerant in small installations, in local delivery trucks and in portable containers.

Applications of liquid fall into four major classifications: beverage; meat packing and processing; industry, foundry

[1]Gas is included in production figures given for liquid CO_2, according to regular industry practice.



Saw cuts 240-lb block of dry ice into quarters for packaging and distribution. Although the trend is toward greater use of carbon dioxide in liquid form, dry ice is not likely to be replaced in some applications

and environmental testing; and chemical. Although the chemical industry currently is the smallest market of these four categories, all are closely associated with chemical processing. Chemical industry applications have been growing constantly.

Carbon Dioxide Used In Aerosol Packaging

New uses in chemical processing include the cooling of products and propellants used in aerosol packaging, and a number of applications where the inerting capabilities of carbon dioxide are used in conjunction with its function as a coolant.

Cold-testing and processing applications are widespread. In one interesting installation, a Chicago company uses bulk CO_2 to provide the low temperature for a wind tunnel's icing simulator. Components for missiles and high-speed aircraft are performance-tested at speeds up to Mach 2.7 in environments equivalent to natural atmospheric conditions of temperature and moisture content.

Several touring demonstration trailers, built by Cardox, are similar to full-scale installations at laboratories that run aircraft and missile parts through complex tests. These are used to present small-scale examples of low-temperature testing to aircraft companies, industrial plants, universities and laboratories.

Soft rubber products, frozen with carbon dioxide, can be ground to shape on an abrasive wheel, and flashings resulting from molding can be broken off in a CO_2-cooled rubber tumbler. (An article on low-temperature deflashing will be run in Sept.)

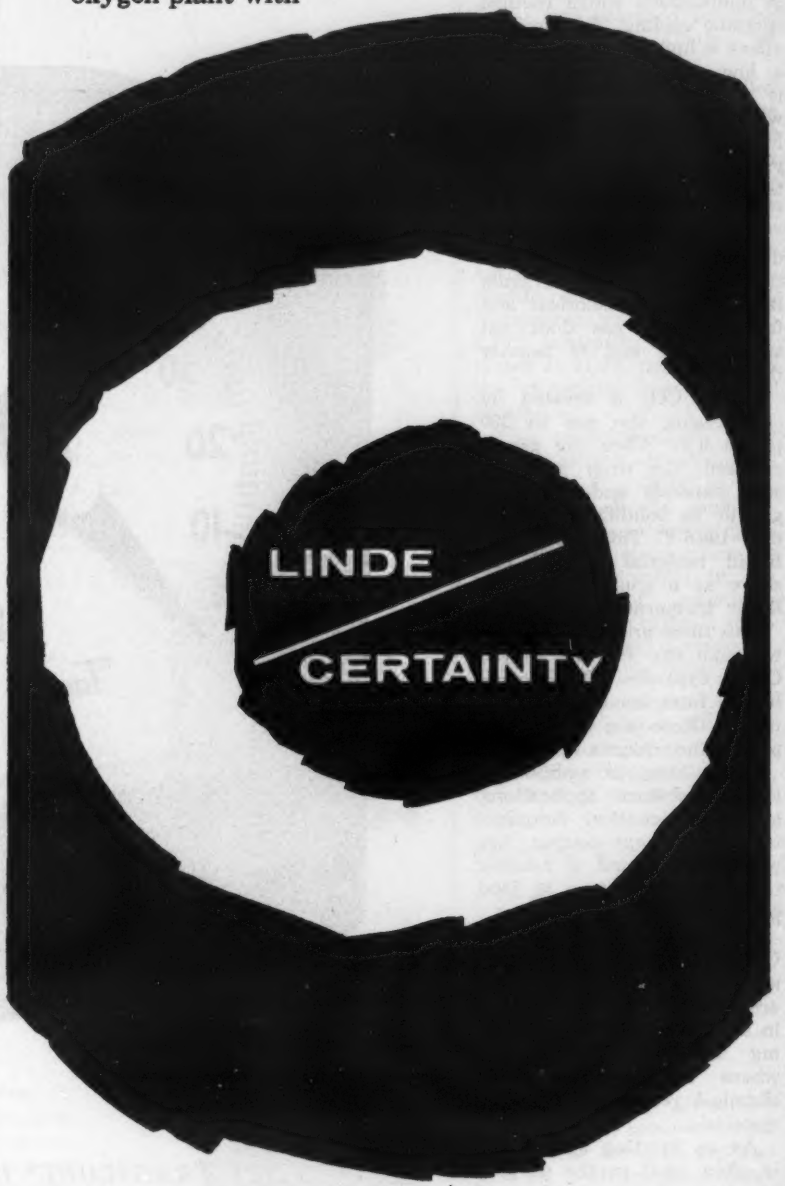
Metal parts can be shrink-fitted by use of CO_2 — a process which uses metal's expansion and contraction properties, instead of welds, bolts or rivets, to join fitted pieces.

CO_2 is often used in place

To next page

chemical processors!

Full automatic control operates your over-the-fence oxygen plant with



CERTAINTY that your oxygen will be delivered via the most advanced techniques of automation available today. CERTAINTY that LINDE's resources in facilities and personnel will provide maximum efficiency of design to fit your needs. CERTAINTY that LINDE's financial arrangements need not involve your capital.

LINDE COMPANY
DIVISION OF UNION CARBIDE CORPORATION

UNION CARBIDE

Check 4804 opposite last page.

Cryogenic cooling

From preceding page

of mechanical refrigeration in applications which require sporadic cooling. The product offers a high cooling rate for a low capital investment. It is commonly used in places where fast cooling is needed for short jobs, such as quickly reducing temperatures in truck bodies for transportation of frozen foods.

Perhaps the reason carbon dioxide has so many applications is that it is so versatile itself. Odorless, colorless and tasteless, this gas does not support life and is heavier than air.

Liquid CO_2 is created by compressing the gas to 300 psi at 0°F. When the gas is released, the drop in pressure expands and cools the gas to its solidification point of −109.6°F. This is how the liquid material at 0°F can serve as a coolant at much lower temperatures.

This same procedure is used to make dry ice. The liquid CO_2 is expanded into a chamber to form small snow particles. These are then compressed into blocks of dry ice.

Other uses, in addition to low-temperature applications, are pharmaceutical dehydration, instrument testing, fire extinguishing and a number of other applications in food processing.

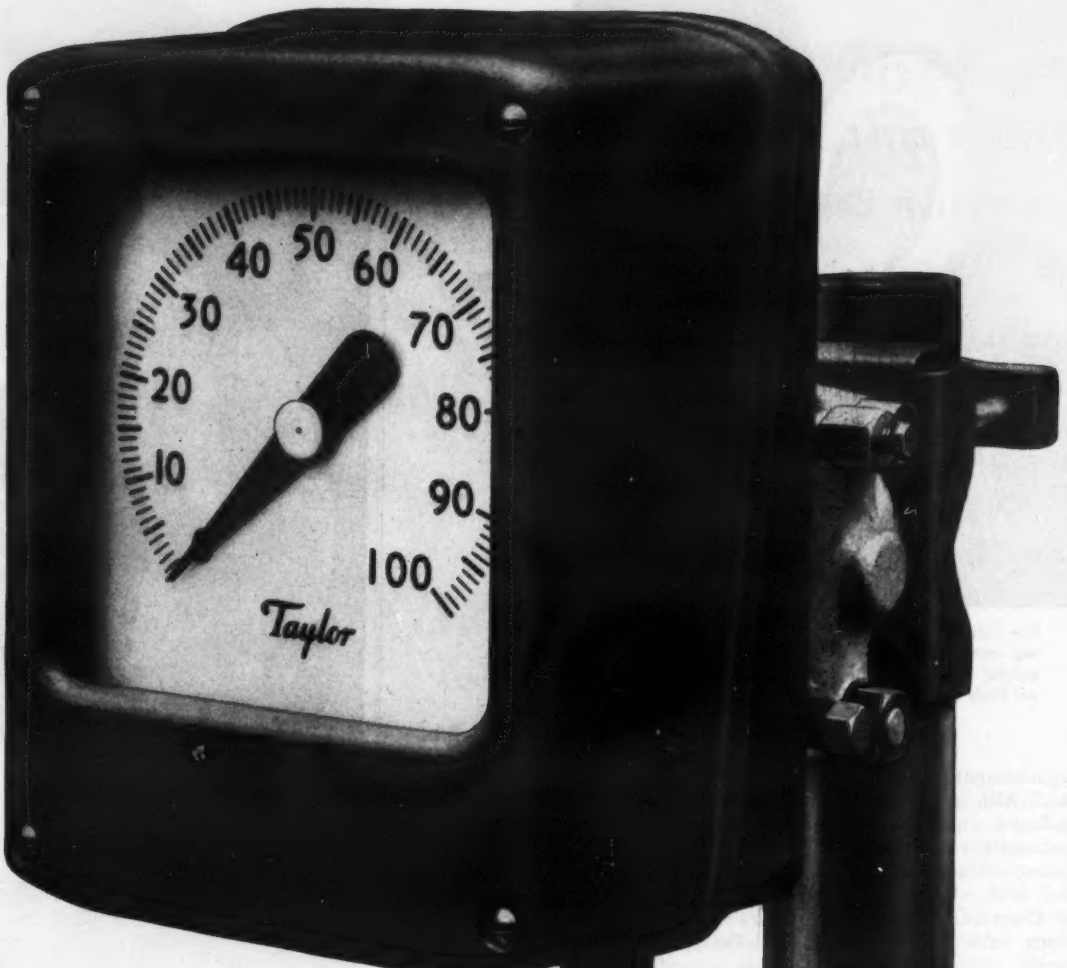
The chemical properties of CO_2 are used to produce a number of carbonates. They are also utilized for pH control in acid reactions, cement curing and other applications where CO_2 enters into a chemical reaction with other materials.

As an inerting agent, CO_2 is often used in the purging of piping, barges, tanks and other enclosed equipment containing combustible fluids or gases. This practice eliminates combustion hazards quickly and economically. ■

Cryogenic cooling system is explained in four-page technical brochure. Unit delivers liquid nitrogen from storage system to cooling area 25' or more away. Cooling capacity is 430 Btu at −320F. Bul AD 4722 — AiResearch Mfg. Div., The Garrett Corporation.

Check 4805 opposite last page.

A DP TRANSMITTER



212T TRANSCOPE® Indicating Flow and DP Transmitter gives you all the features you expect from a truly fine DP Transmitter . . . and the only one that can be calibrated linear with flow as well as differential pressure without changing parts.

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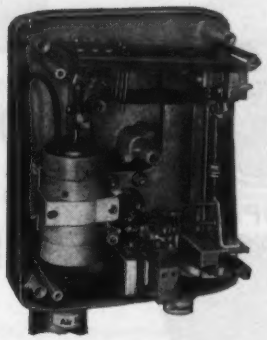
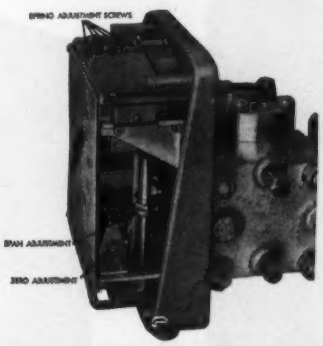
New Taylor 212T Transmitter is first and foremost a superior DP Transmitter . . .

Taylor's 212T TRANSCOPE® Transmitter is an outstanding example of "all this and heaven too". Basically it is a sound DP Transmitter, but when used for flow it can be calibrated to give a linear output without additional parts. It's available in indicating or non-indicating models. And with all its superior features *you pay no premium in price.*

Check the highlights listed here, then call your Taylor Field Engineer for a demonstration and write for **Bulletin 98413.** Taylor Instrument Companies, Rochester, N. Y., and Toronto, Ontario.



Open case design provides free access for maintenance.



Diagonally split case gives easy access for all adjustments.

Liquid-filled primary unit means:

Positive overrange protection. Hydraulic overrange protection to full body rating in *either* direction.

Isolation of internal parts. Working parts—except diaphragms themselves—are exposed only to non-corrosive silicone oil.

Built-in damping. Effective pulsation damping occurs at frequencies greater than approximately 2 cycles per second.

Exceptional rangeability.

Normal range span is 20 to 250" water. However, superior design and engineering quality permits over-calibration in either direction with good performance.

Mounting and connection versatility for any installation.

Process connections can be at top, at back or at bottom. ½" NPT fittings set on 2⅛" centers for convenience in piping directly to standard orifice flange taps. Universal mounting bracket can be secured to standard 2" horizontal or vertical pipe, or bolted to flat surface.

Good, clean mechanical design.

Diagonally split case makes all calibration adjustments easily accessible by simply removing cover. Zero adjustments can be made externally. Sturdy, protective case, designed for field locations.

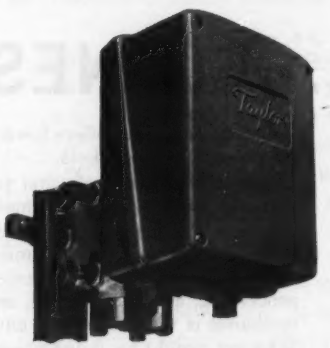
PLUS

Servo power for square root extraction.

Produces an output directly proportional to flow or differential pressure . . . a cost-and time-saving feature when applied to computer control, or ratio and cascade control systems.

Servo power for indication accuracy.

Powerful servo relay drives tape movement to provide indication on a big 11¾" scale. It eliminates the necessity for externally mounted receiver gages.



Non-indicating model, showing rear mounting and bottom process connections.

MEAN ACCURACY FIRST

Check 4806 opposite last page.

Ductile iron

From page 35

21% and 1.8% respectively This enhanced austenite stability and provided an alloy with 25-28 ft-lb Charpy V-notch values.

To improve this D-2C alloy further, it was modified to make it even more suitable for cryogenic conditions. By ranging the silicon to the high side and thus reducing the carbide phase to a minimum, and normalizing to retain carbon in solution, a more ductile alloy was prepared. Manganese was increased to 3.75% minimum, nickel maintained at 21.0% minimum and the chromium kept at 0.5% maximum.

This modified D-2C alloy has satisfactory impact toughness down to −320°F or less, along with all the desirable metallurgical processing characteristics of a cast iron. It should prove useful in the manufacture of processing equipment for cryogenic service. Patent work is currently underway on the alloy.

(For further information on the D-2C modified Ni-Resist ductile iron, contact The International Nickel Company, Inc., 67 Wall St., New York 5, N.Y.)

Check 4807 opposite last page.

Economical, easy to use hydrogen purifiers for cc/min to cu ft/hr

Units can be built for several thousand cfh

Uses: Producing ultra-pure hydrogen from impure hydrogen sources for such applications as: hydrogenation reactions, production of metal hydrides; research on epitaxial crystal growth; gas chromatography and flame photometry studies.

Features: Economical, easy-to-operate purifiers can be supplied to produce milliliters per minute or cubic feet (200) per hour quantities. Equipment can be built to produce several thousand cu ft per hr of pure hydrogen.

Description: An impure source gas containing free hy-

COMMON SENSE SOLUTION TO EXTRACTION COSTS

...CELANESE METHANOL

Celanese Methanol offers lower raw material costs in the face of *rising* prices for other alcohols.

Common sense suggests that you examine your applications with an eye to cost savings through the use of methanol in place of the alcohol you're now using.

Celanese Methanol may offer substantial advantages over isopropanol in automotive chemicals, laminates, pharmaceutical extractions, metal cleaning and petroleum processing . . . or in place of ethanol in petroleum processing, as a dye solvent, and in film manufacture. In many applications, methanol is the cost-saving and efficient solution.

Why get caught by rising prices, when low-cost methanol is promptly available from Celanese. Write for Product Bulletin S-03-6, or contact your Celanese representative or distributor for full details. Now.

Celanese Chemical Company, Dept. 591-G, 522 Fifth Ave., New York 36, N.Y.

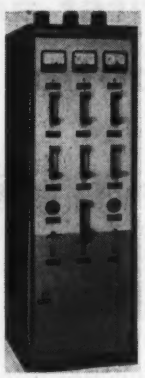
Celanese®

Celanese Chemical Company is a Division of Celanese Corporation of America.
Canadian Affiliate: Canadian Chemical Company Limited, Montreal, Toronto, Vancouver.
Export Sales: Amcel Co., Inc., and Pan Amcel Co., Inc., 522 Fifth Avenue, New York 36, New York

Check 4808 opposite last page.

drogen flows under pressure into a stainless steel jacket and over a bundle of palladium alloy tubes. Palladium permits hydrogen to pass through tube walls, but bars all other gases including water vapor.

Palladium-silver alloy, unlike pure palladium, exhibits



Purifier delivers 200 cfh of ultra-pure hydrogen

no distortion when subjected to repeated heating and cooling cycles. Impurities, along with a small stream of hydrogen, bleed continuously to a discharge stack where they are burned or piped to a point of safe discharge.

Hydrogen that passes through the tube walls to outlet is so pure that no presently known analytical techniques can detect any impurities.

Operation of purifier is extremely simple. Unit plugs into any 115-volt AC outlet, pressure and gas flow are adjusted to proper operating range and pure hydrogen collected at outlet. Standard models for small volumes (40 to 100 milliliters) weigh 10 to 15 pounds. Units with capacities from 5 to 50 cu ft per hour weigh about 60 pounds.

(Serfass hydrogen purifiers are a product of Milton Roy Company, 1300 E. Mermaid Lane, Philadelphia 18, Pennsylvania).

Check 4809 opposite last page.

For more information on developments in the section, check the Reader Service Slip.

Fiber-bonding agent imparts increased paper strength

Dry and wet tensile and bursting strengths are improved with wet-end addition of dialdehyde starch

PRODUCTION of dialdehyde starch (CHEMICAL PROCESSING, November 1959, p. 62) has now reached nearly one million pounds per year at the Zeeland, Michigan, plant of Miles Chemical Company. Current facilities can be quickly expanded beyond this level.

Continued research, since the product's introduction almost three years ago, indicates a broad commercial application range. When this is achieved, new capacity will be built to take care of any requirements in the multi-million range. At that level this polyaldehyde may be priced at 35-40¢ per pound.

In addition to tobacco, adhesive, plywood and leather applications, a promising use is developing in the paper field. Although a variety of derivatives are available, Sumstar®-190 has been developed specifically for wet-end addition in paper making.

Improves Paper Quality

The use of this derivative in paper making will result in increased or improved dry and wet tensile, wet-tearing and bursting strengths, as well as folding endurance and porosity.

Strength properties are not brought about by a secondary polymerization within the paper web. Neither can the effects be attributed to adhesive qualities, since films of the material do not possess great strength. Substantial strength improvements result from a fiber-bonding phenomenon when small amounts are added to the paper fibers.

Variations in the quantity of the polymer used permit paper products to be made with the aforementioned properties, optimum for specific applications.

Increases in strength properties are obtainable immediately and fully after drying under ordinary operating conditions, thus eliminating the need for prolonged storage and curing. Many types of pulps have responded to treatment with the material.

In addition to property improvements, other benefits can be expected such as: reduction of beating time, improved drainage rate, increased rate of production, improved for-

MACHINE-RUN DATA

50-lb Basis Wt (24" x 36"-500) Bleached Western Kraft
440 ml Canadian Standard Freeness

	Control	Sumstar 1% ** Treated	Change	Sumstar 2% ** Treated	Change
M D dry tensile strength (lb/in)	29.9	41.5	+ 38.8%	43.8	+ 46.6%
C D dry tensile strength (lb/in)	15.1	18.3	+ 21.2%	18.5	+ 22.5%
M D wet tensile strength (lb/in)*	1.6	12.3	+688 %	12.9	+720 %
C D wet tensile strength (lb/in)*	.96	5.4	+465 %	5.9	+525 %
Burst (psi)	33.6	50.3	+ 49.7%	51.6	+ 53.6%
M D dry tearing resistance (gm)	75	64	− 14.6%	63	− 16 %
C D dry tearing resistance (gm)	96	84	− 12.5%	72	− 25 %
M D wet tearing resistance (gm)	33	118	+257 %	196	+494 %
C D wet tearing resistance (gm)	33	134	+306 %	144	+336 %
Porosity (sec)	55	40.0	+ 27 %	40.2	+ 27 %
MIT folding endurance (M D)	289	—	—	710	+146 %
MIT folding endurance (C D)	73	—	—	600	+720 %

*10-min soak, distilled water, 72°F

**Based on O. D. pulp, pretreated with a coupling agent

Fiber-bonding agent imparts increased paper strength *From preceding page*

mation, ease of broke recovery and simplified procedures.

Quality improvement is shown unmistakably in the data tabulated on Bleached Western Kraft paper (see table on page 51).

Machine runs with the material have resulted in dry-strength increases of 25-100% over controls. Currently under study are the effects of using the material to impart strength properties which will allow reduction in time required for beating a particular furnish.

Wet-strength properties are quickly achieved as the paper comes off the machine. Curing time is eliminated; consequently paper can be shipped the same day it is made.

Improvement in wet-tearing strength suggests applications for bags, toweling, tissue and specialties.

Densometer readings show that the product does not adversely affect the porosity of paper into which it is incorporated by wet-end addition.

Wet broke can be returned directly to the stock-preparation system and dry broke may be recovered by repulping.

Dispersion Preparation Explained

Sumstar-190 is supplied as a dry powder, which is stable under normal conditions of storage. For use in wet-end addition, it may be dispersed in water by a cooking procedure to convert it into a suitable dispersion.

Mechanism of dispersing this high molecular-weight hydrophilic polymer differs from the normal preparation of solutions.

Dispersing procedure involves a successive hydration of structural layers, which can be hastened by a constant supply of heat until a complete penetration of water into the granules has taken place.

Governing factors in the preparation stage include hardness of water, cooking concentration, cooking temperature and time, use of a dispersing aid and agitation requirements.

WATER HARDNESS — If available, deionized or distilled water is the preferred dispersion medium. In case natural water is the only source, adjustment of the pH to the acid range is necessary to obtain dispersions with proper characteristics. Depending on the hardness of water and type of acid used, the amount of neutralizing agent varies from 40-100 gm per 100 gal of natural water.

COOKING CONCENTRATION — Cooking of the dispersion concentration requires 3% of the compound by weight. Resulting dispersion is satisfactory for a machine run. For preparation of hand sheets, a dilution to 1% solids is recommended.

COOKING TEMPERATURE AND TIME — pH-adjusted natural water or deionized water is heated to 188-196°F. Based on the weight of water, 3% of the material is added with agitation together with 15% sodium bisulfite as a dispersing aid. At this point dialdehyde starch will swell and disperse after 10-15 minutes, reaching a peak viscosity at 25-35 minutes.

For proper characteristics, an additional heating period of 5-10 minutes is required — for a total heating period of 30-45 minutes. Dispersion is then cooled rapidly to room temperature and is ready for use.

Sodium bisulfite facilitates the successive hydration and stabilizes the final dispersion.

AGITATION — During the swelling period, agitation provides a means for equal heat transfer. However, this procedure should be carried out to avoid excessive mechanical shear, which could lead to undesirable breakdown of heat-swollen granules.

COUPLING AGENT — This agent makes the cellulose more receptive to the fiber-bonding agent. A number of coupling agents may be used. Recommended and used in this procedure are dicyandiamide-formaldehyde condensation products. Originally supplied as water solutions at concentrations of 30-50% solids, the condensation products should be diluted to 2% solids prior to addition to the pulp.

How to Add to Beater Or Machine Chest

The following seven-step outline may be followed in making additions to beater or machine chest:

1) Beat pulp to desired freeness.

2) Adjust pH of stock in beater or chest to 4.5-6.0.

3) Add a sufficient quantity of previously prepared 2%-solids solution of coupling agent with agitation, so that the amount (solids basis) is 0.5% of O.D. pulp. A 30-minute mix will insure complete interaction.

4) Add a sufficient amount of previously prepared dispersion to the stock so that the amount of dialdehyde starch is equivalent to 1% of the O.D. pulp. Mix thoroughly for 10 minutes.

5) Adjust pH of stock to 4.5-5.0 with acid or alum.

6) Mix thoroughly for 10 minutes.

7) Pump the furnish to the head box, maintaining the pH at 4.5-5.0.

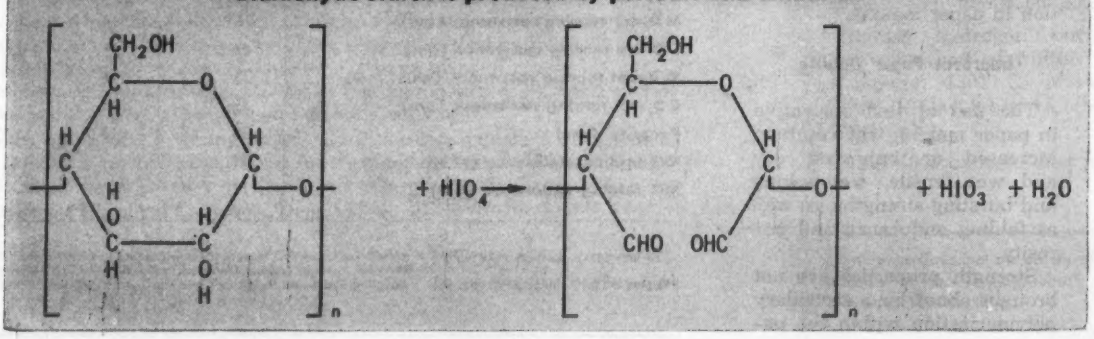
Variations in the quantities of additives may be made. However, machine-run data show optimum results are obtained when a 2:1 ratio of dialdehyde starch to coupling agent is maintained. If other materials (such as rosin, starch, fillers, etc.) are added to the furnish, they should follow the addition of the dialdehyde starch.

These tests are based on the use of 1% and 2% of dialdehyde starch. Current tests indicate as low as 0.5% is satisfactory for many applications.

(Sumstar®-190 is a product of the Miles Chemical Company, Division of Miles Laboratories, Inc., Elkhart, Indiana.)

Check 4810 opposite last page.

Dialdehyde starch is produced by periodic acid oxidation



Handling made easier by solid form of n-butyllithium

Uses: Product can be used in practically all applications where n-butyllithium solutions are ordinarily employed.

Features: Solid form is non-pyrophoric and is classified as a flammable solid, n.o.s. It has good stability on moderate exposure to air, and offers much

Non-pyrophoric n-butyllithium will not ignite even when immersed in water

greater convenience and safety in storage, shipping and use as compared to conventional forms of the product.

Description: Solid form of n-butyllithium is a homogeneous suspension of the material in a specially blended paraffin wax medium. It may be cut or handled in open air for periods up to two hours without significant loss of alkyl. Although it can be ignited by flame, fire is slow burning and easily extinguished.

Commercial production of the new product is restricted to one inch diameter by five inch cast sticks with either 20 or 30 weight per cent of butyllithium. Shipment will be made in hermetically sealed disposable unpressurized cans.

(Solid n-butyllithium is a product of Lithium Corporation of America, 500 Fifth Ave., New York 36, N.Y.)

Check 4811 opposite last page.

For more information on developments in the section, check the Reader Service Slip.

50% HF EXPANSION

NEWS! Hydrofluoric acid capacity at General Chemical's North Claymont, Delaware, plant has been increased 50%. These new enlarged facilities are now on stream, ready to serve you. This and other recent expansions have raised General's HF capacity more than 100% over the past five years!

General Chemical, the nation's primary merchant producer of aqueous and anhydrous hydrofluoric acid, has three other acid-producing locations: Baton Rouge, La.; Nitro, W. Va., and Valleyfield, Que.* As you'd expect, General is your most dependable source for HF! For more information, prices, delivery – call or write your nearest General Chemical office.

Allied Chemical

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N. Y.

*In Canada: The Nichols Chemical Company, Limited.

Check 4812 opposite last page.

PETRO® BALL VALVE

FEATURES DOUBLE UNIONS AT NO EXTRA COST!

After years of thorough research and testing, Clayton Mark has introduced its new PETRO BALL VALVE—with outstanding engineering features and built-in performance, which makes it singularly attractive to almost every piping and valve application. The essence of simplicity, the valve body can be removed without disturbing any other part of the piping . . . in just 13 seconds! The PETRO BALL VALVE is designed with features that make it definitely superior to other valves: ① easy quarter-turn improved handle, ② completely contained seals, ③ floating ball gives tighter seal, ④ interchangeable dual seats, ⑤ largest port opening, ⑥ rust-proof one-piece forging and ⑦ cadmium-plated nuts. And remember—*each and every PETRO BALL VALVE is air-tested under 100 pounds pressure to assure perfect operation.*

Distributorships available on a selective basis

1605

CLAYTON MARK & COMPANY

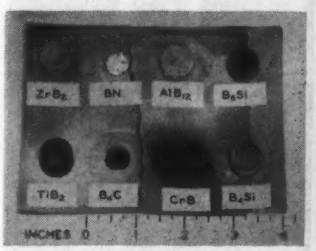
1900 DEMPSTER STREET · EVANSTON, ILLINOIS · U.S.A.

PUMPS · WATER WELL SUPPLIES · CONDUIT · UNIONS · TUBING

Check 4813 opposite last page.

Boron silicide powder can be used in air at 2550°F

Uses: Product is applicable to nuclear reactors as a neutron control device for shielding structures and as a burnable poison to absorb excess neutrons. Excellent oxidation and thermal shock resistance suggest uses in general refractory areas where boron carbide and boron nitride cannot function at high temperatures in air.



A selection of borides after being heated in air at 2500°F for 48 hr

Features: High-boron-content compound can be used at 2550°F in air for extended periods.

Description: Boron silicide is available in three purity grades. It can be fabricated by conventional powder metallurgical and ceramic techniques. It can be hot pressed to give very dense bodies, slip cast, oxide-bonded or self-bonded. Oxide-bonded boron silicide is machineable when pre-sintered at about 2000°F in air.

(Boron silicide is a product of Allis-Chalmers Manufacturing Company, Milwaukee 1, Wis.)

Check 4814 opposite last page.

Water-emulsion polymers with vinylpyrrolidone form tough films

Uses: Applications for this series of copolymers will include fields of adhesives, paper coatings, non woven fiber binders, metal primers and wood coatings. They have considerable potential as acid-stable detergent opacifiers and

aerosol starch resins.

Features: Polymers offer dye receptivity, unusual emulsion stability and adhesive properties.

Description: First three products of this group, of water-emulsion copolymers of vinylpyrrolidone will be: Polectron 130 — a vinylpyrrolidone/ethyl acrylate copolymer emulsion; Polectron 430 — a vinylpyrrolidone/styrene copolymer emulsion; and Polectron 450 — another vinylpyrrolidone/styrene copolymer emulsion. Each has a 40% solids content.

All three are insoluble in water, ethyl alcohol, ethyl acetate, acetone, methyl ethyl ketone, benzene, carbone tetrachloride, heptane, and dioxane. Exceptions will be found in 430 which is partly soluble in benzene and 450 which is partly soluble in water.

(Polectron water-emulsion polymers are product of the Acetylene Chemicals Department, Antara Chemicals, Division, General Aniline & Film Corporation, 435 Hudson St., New York 14, N.Y.)

Check 4815 opposite last page.

Fast, low-cost molding of urethane possible with granular resin

Uses: Material can be used to fabricate hose, cable jacketing, gears or other parts.

Features: Granular form of urethane elastomer permits mass production by fast, low-cost injection and transfer molding or extrusion. Existing molds and equipment can be used.

Description: Resin, trade-named Texin, is supplied in different hardness grades ranging from a soft material for such parts as diaphragms and seals to one so hard it has outworn machine steel. An elongation of 500 to 800 percent is possible with durometer hardness of 60-65 Shore A.

(Texin resin is a product of Mobay Chemical Company, Pittsburgh 5, Pa.)

Check 4816 opposite last page.

This is AMERICAN OIL COMPANY

Our organization has more than 70 years' experience in the oil business. We are one of the largest petroleum organizations in America.

We believe the experienced American Oil representative who calls on you, plus the products and facilities which he has at his disposal, are reasons why you will like to do business with us.

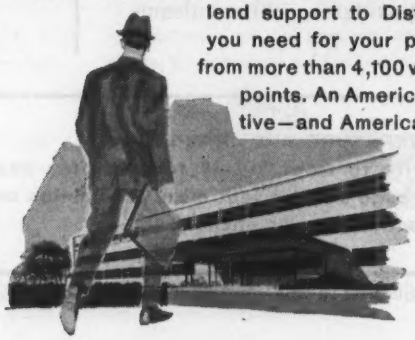
Your American Oil representative receives special training for his job at our Sales Engineering School. He is given concentrated basic instruction in all phases of petroleum product quality and application. According to a planned schedule, he returns for an advanced course and then again for post-graduate work.

In our Marketing Technical Service Department are specialists who are recognized authorities in their fields. These senior consultants may be called in to work with you on any specialized problem.

More than 1,000 research scientists and technicians are at work in our research laboratories developing new products and finding ways to improve present products. Their mission: To help your American Oil representative help you lower your maintenance costs and stretch your maintenance dollars.

Twelve American Oil refineries give flexibility to the production of petroleum products for industry. They help make it possible to assure prompt delivery. Upwards of 2,875 miles of product pipelines augment delivery facilities.

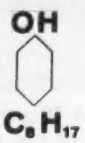
American Oil representatives operate from 74 District Offices. Thirteen Regional Offices strategically located throughout the country lend support to District Offices. The products you need for your plant or fleet are available from more than 4,100 warehouses and distribution points. An American Oil Company representative—and American Oil products—are only a telephone call from your office. We invite you to make that phone call. Or write **American Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.**



AMERICAN OIL COMPANY

Check 4817 opposite last page.

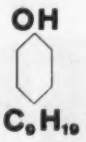
OCTYLPHENOL



C_8H_{17}

white flakes

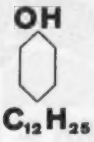
NONYLPHENOL



C_9H_{19}

clear liquid

DODECYLPHENOL

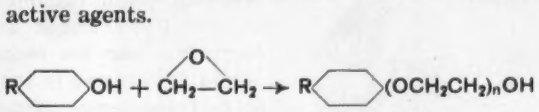


$C_{12}H_{25}$

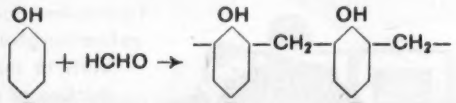
clear liquid

Productive alkylphenol reactions

Etherification with Ethylene Oxide. The length of the polyoxyethylene chain may be varied by controlling the amount of ethylene oxide used. Resulting products are widely used as nonionic surface-active agents.

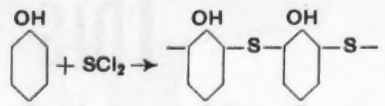


Condensation with Aldehydes. The polymers formed are oil-soluble, soft and tacky, and not thermosetting. Alkylphenols, used with phenol, can modify the properties of ordinary phenolic resins—can improve oil solubility, water resistance, electrical resistance. Possible use: oil-soluble varnishes for electrical insulation.

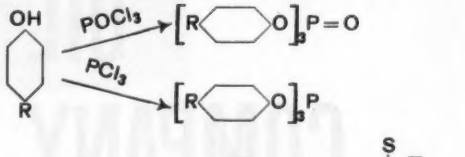


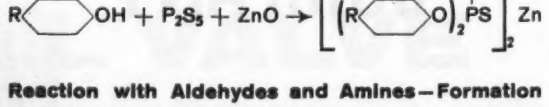
Calcium and barium salts of alkylphenol-formaldehyde polymers have been found useful as corrosion inhibitors, antioxidants, and sludge-dispersants for automotive lubricating oils.

Condensation with Sulfur Halides. Potential applications of alkaline earth metallic salts of alkylphenol/sulfur halide condensates are lubricating oil additives, rubber antioxidants, rubber vulcanization accelerators.

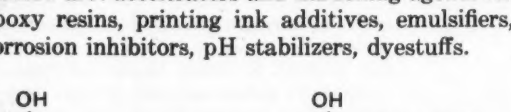


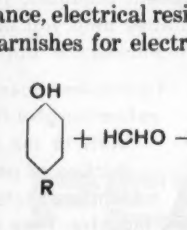
Preparation of Phosphorus Esters. Mono-, di-, and trialkylphenyl phosphates are prepared by reaction of alkylphenol with phosphorus oxychloride. Alkylphenyl phosphites are similarly made from phosphorus trichloride. Reaction with phosphorus sulfides gives various thio- and dithiophosphate esters. Potential uses: lubricating oil additives, plasticizers for cellulose esters and ethers.





Reaction with Aldehydes and Amines—Formation of Mannich Bases. Possible uses of the products formed are: accelerators and hardening agents for epoxy resins, printing ink additives, emulsifiers, corrosion inhibitors, pH stabilizers, dyestuffs.





LITERATURE AND SAMPLES
Write to Dept. SP-18 for samples and 18-page booklet with more information on reactions of alkylphenols.

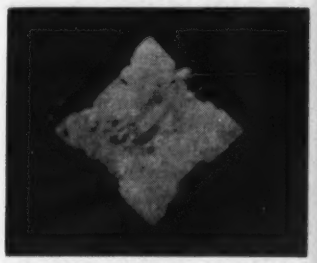
ROHM & HAAS
PHILADELPHIA 5, PA.

Suggested alkylphenol uses should not be understood as recommendations to violate any patents.

Check 4818 opposite last page.

Faster dissolving rate provided by new salt form

Salt formed with a unique crystal structure has a fast dissolving rate, makes an ideal blending agent, has a low weight per volume and excellent storing qualities. Called Dendritic salt, product is of fine granulation like fine vacuum pan salt. Unlike the



Chemical treatment causes salt crystals to grow faster on the corners resulting in characteristic star shape

cubical structure of regular vacuum pan salt or the crystal aggregates of flake salt, Dendritic's crystals are branch or star like in basic form.

Product is obtained by adding a chemical to the brine as it is evaporated in vacuum pan. Experimental uses have shown that this salt has performed excellently as a bulking agent.

(Dendritic Salt is a product of Morton Salt Company, 110 N. Wacker Drive, Chicago 6, Ill.)

Check 4819 opposite last page.

Highly polar fatty amides are very soluble in variety of compounds

Uses: Preliminary investigations indicated that compounds will be useful in preparation of solvents, corrosion inhibitors, surface active agents. They could also be used to adjust the polarity and impart anti-polarity properties, or as reaction solvents in polymerization reactions.

Features: Compounds are highly polar and very soluble in a number of compounds. Unusual properties

are derived from amide group and two methyl groups attached to the nitrogen. They will dissolve over their own weight of water. They are completely soluble in all common organic solvents, hydrocarbons, plasticizers, fatty acids, waxes and vegetable oils and esters. Even some of the silicons are compatible with these fatty amides.

Description: Called Hallcomids, they are a class of disubstituted amides of short to long chain saturated and unsaturated fatty acids in which the hydrogens attached to the nitrogen have been replaced by metal groups. They have from eight to 18 carbon atoms and range from a colorless to very pale yellow liquid to a yellow solid.

(Hallcomids are products of C. P. Hall Company of Illinois, 5245 W. 73rd St., Chicago 38, Illinois.)

Check 4820 opposite last page.

Obtain rapid dispersing in paper manufacture without frothing

Uses: Material can be used in paper production for dispersion of natural pitch in unbleached and mechanical wood pulp. It has also found application as an economical dispersing agent for pigments and fillers.

Features: Because of its finely divided form, dispersing agent is said to go into solution quite rapidly without causing frothing or foaming in milling, grinding and mixing operations. It has been found non-dusting in plant applications.

Description: Known as Tamol SN, dispersing agent is described chemically as a neutral salt of a complex, condensed organic acid. It is supplied as a light tan powder. Dispersed action is effective in both acidic and basic solutions. It has good stability toward mineral acids and bases.

(Tamol SN dispersing agent is a product of Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.)

Check 4821 opposite last page.

NEW SELF-CROSSLINKING COPOLYMER LATEX

A graphic portrayal of the three-dimensional network that is set up during drying of X-LINK 2833, National's new self-crosslinking copolymer latex. This network binds the molecules to one another by chemical bonds and prevents them from flowing past one another upon application of a load.

major improvement in water, solvent and heat resistance

Time again to take a fresh look at vinyl and acrylic properties. National's new X-LINK 2833—a self-crosslinking vinyl-acrylic copolymer latex—substantially improves water, solvent and heat or creep resistance. It also improves film strength. It broadens the scope of practical applications for vinyls and acrylics.

X-LINK 2833 is self-reactive. It crosslinks rapidly upon drying without the addition of thermosetting resins. Eliminates problems of limited stability, odor, compatibility and high curing temperatures usually associated with formulated products.

X-LINK 2833 is suggested for nonwoven binders, wallpaper coverings, asbestos beater addition, paper saturation, vinyl organosol tie coats, adhesive uses, awning coatings, pulp molded products and specialty coatings for textiles and paper. Write for complete technical information.

National RESINS

NATIONAL STARCH and CHEMICAL CORPORATION

750 Third Avenue, New York 17 • 3641 So. Washtenaw Avenue, Chicago 32 • 735 Battery Street, San Francisco 11

And All Principal Cities in the United States, Canada, England and Mexico

Check 4822 opposite last page.

Tighten Down on FOAM

with Dow Corning Silicone Defoamers*

There's a *right* tool for every job. In foam control it's Dow Corning silicone antifoamers or defoamers . . . job-proved thousands of times over as the most efficient, most economical, and most versatile foam suppressors available.

*At prescribed levels, are sanctioned by FDA

FREE SAMPLE
and new manual on foam control

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

Dept. 2719

Please rush a FREE SAMPLE of a Dow Corning silicone defoamer for my product or process, which is (indicate if food, aqueous, oil or other): ----------

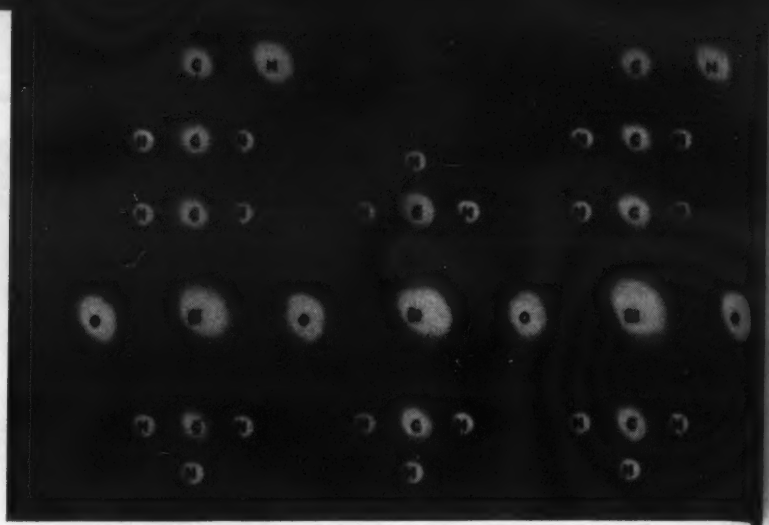
NAME

POSITION

COMPANY

ADDRESS

Check 4823 opposite last page.



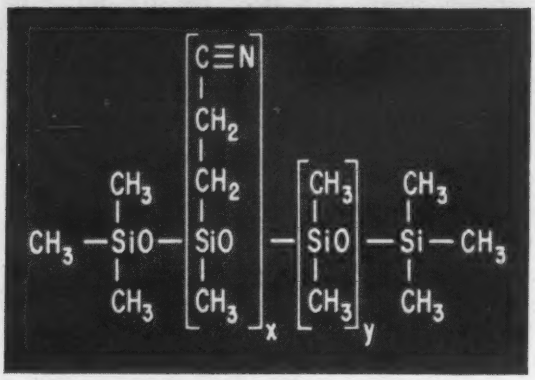
Silicone fluids like these have high polarity because of their nitrile groups. The result is solvent resistance, limited electrical conductivity and high dielectric constant

Nitrile silicone fluids insoluble in non-polar solvents

Useful as non-aqueous antifoams and base stocks for solvent-resistant greases, coatings

TYPICAL PHYSICIAL PROPERTIES

	Nitrile Silicone Fluids				Typical Dimethyl Silicone
	XF-1105	XF-1112	XF-1125	XF-1150	SF-96 (100)
Mole % — CH_2CH_2CN	5	12.5	25	50	—
Approx Wt % Nitrile As CN	3.2%	7.6%	14.0%	23.0%	—
Appearance	Pale Yellow to Water White				Clear, Water White, Oily
Viscosity Range, 25°C	100±20	100±20	350-550	800-1300	100±5%
Viscosity: 100°F	92	84	318	545	80
210°F	30	23	43	71	33
Viscosity Temp Coeff	0.673	0.716	0.760	0.870	0.590
Pour Point	<−110°F	<−110°F	−80°F	−13°F	−67°F
Refractive Index, 25°C	1.4105	1.4197	1.4320	1.4605	1.4027
Specific Gravity, 20°C/20°C	0.99	1.00	1.05	1.08	0.92
Surface Tension, 25°C (dynes/cm)	21.9	23.6	26.0	36.7	20.9
Coeff Thermal Expansion (cc/cc/°C)	8.87×10^{-4}	8.55×10^{-4}	6.96×10^{-4}	6.03×10^{-4}	9.45×10^{-4}
Wt Loss (150°C—24 hr)	2.2%	8.4%	7.0%	4.3%	0.5%
Flash Point	510°F	490°F	590°F	640°F	600°F
Fire Point	560°F	540°F	630°F	660°F	600°F
Specific Heat	0.39	0.39	0.39	0.39	0.35



Nitrile silicone fluids have this general formula

Uses: Of interest in electrical applications, as non-aqueous antifoams, base stocks for solvent-resistant greases and coatings, antistatic agents, components in polish formulations, plasticizers and additives for plasticizers.

Features: Properties of these fluids are different from those of the normal types. They are not soluble in non-polar solvents. They contain nitrile groups which give them high polarity and provide such properties as solvent resistance, limited electrical conductivity and high dielectric constants. Fluids are similar to dimethyl silicone fluids in that they have low surface-tension characteristics.

Description: Materials are available in experimental quantities and will be made available in drum quantities during 1962 if warranted by market demand. Four compounds are available where the mole percent of the cyanoethylmethylsiloxy unit is 10, 25, 50 and 100%. This corresponds to 5, 12.5, 25 and 50% substitution of cyanoethyl units for methyl units in the dimethyl polysiloxane structure.

POLARITY — This is high, relative to standard fluids. Standard fluids have dielectric constants in the range of 2.6-3.0 at 60 cycles, whereas this family ranges from approximately three to 20.

SOLUBILITY — Polarity makes the higher nitrile containing fluids insoluble in non-polar solvents such as aliphatic and aromatic hydrocarbons, and soluble in certain polar solvents such as alcohols, ketones and ethers.

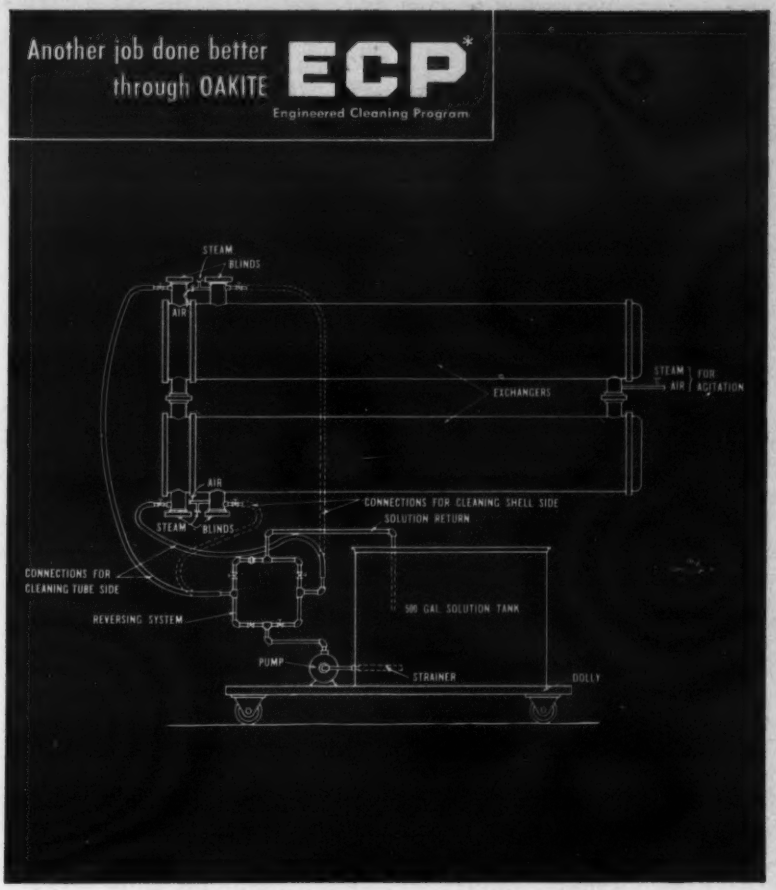
These solubility characteristics make the fluids suitable where oil- and solvent-resistant fluids or coatings (such as lubricants or greases) are desired. Varying degrees of insolubility in non-polar solvents are possible, depending on the nitrile content.

HYDROLYTIC STABILITY — After 90 hours in boiling distilled water there is no evidence of hydrolysis or decomposition. Viscosity remains unchanged, with no evidence of any effect on the nitrile group. Nitrile group is subject to hydrolysis in strong acids or bases. Aqueous emulsions are equally stable with non-ionic emulsifiers.

THERMAL STABILITY — Weight-loss tests indicate possible usefulness for long periods at 150°C. At high temperatures, it is believed that these fluids will not have the thermal stability of other methyl and phenyl silicone fluids.

ELECTRICAL CONDUCTIVITY — Where normal silicones have a volume resistivity in the range of 10^{13} to 10^{14} ohm-centimeters, nitrile silicone fluids are somewhat more conductive and can be formulated with volume resistivities in the range of 10^{9} ohm-centimeters.

TOXICITY — Preliminary toxicological tests indicate



Heat exchanger cleaning made easy —specialized chemicals do the work

An Oakite Engineered Cleaning Program avoids downtime problems by substituting the tireless efficiency of *chemical* cleaning in place of the labored—and haphazard—efforts of manpower.

Take the actual case history of an after cooler with a throughput of phthalic anhydride. Periodically, it loaded up with a pitch-like residue. The whole line would be pulled off-stream for 4 or 5 days while crews sweated around the clock drilling out and rodding each of 500 tubes. Worse yet, drills occasionally went off-center, puncturing tubes and causing *more* downtime for costly repairs.

Instead of muscle-power, the Oakite ECP called for week-end circulation of a mixture of Oakite 24 and Oakite 8, followed by three hours of pressurized water rinse. Result: 500 tubes as slick as rifle barrels—and not so much as a scratch on any of them.

*A comprehensive year-round, plant-wide cleaning program, the Oakite ECP is always specifically tailored to the individual process plant by the Oakite man and the plant engineer. It details methods, materials and schedules for each cleaning chore you face. And it works, because it's built from the engineer's knowledge of equipment and problems and the Oakite man's list of 170 specialized materials, his background in chemical cleaning and his personal supervision.

Write for Bulletin F-10822. Oakite Products, Inc., 18F Rector Street, New York 6, N. Y.

OAKITE
over 50 Est. 1909 years' leadership in industrial cleaning

Check 4824 opposite last page.

that the cyanoethyl silicone fluids are relatively non-toxic. Complete information on the toxicological effects of high-temperature decomposition products is not available.

(Nitrile silicone fluids are available in experimental quantities only and are products of the General Electric Company, Silicone Products Department, Waterford, New York)

Check 4826 opposite last page.

Greater strength given molecular sieves

Unchanged in adsorption characteristics from former 13X sieve which it replaces, strengthened molecular sieve provides almost six times the resistance to attrition losses. Improved pellets have a crush strength over three times that of previous pellets. They possess a slightly higher bulk density.

Molecular sieve Type 13X is used for hydrocarbon sweetening, gas drying, gas purification and other applications where high capacity and efficiency are requisities.

(Molecular sieve Type 13X is a product of Linde Co., Union Carbide Corp., 260 Madison Ave., New York 16, N.Y.)

Check 4827 opposite last page.

Impact strength up 40% over general purpose polyethylene resins

Uses: Resin is recommended for film extrusion applications.

Features: Film resin has 40% greater impact than general purpose resins. Strength-weight ratio of extruded film permits use of lighter gages to meet toughness requirements on any specific application.

Description: Polyethylene 706X is extruded at temperatures 10 to 15°F above those normally used for general purpose resin. Apparent bulk

Molasses Dairy Feeds Clog Scale Openings

Stainless steel interiors of automatic feed weighing scales have long provided good service for users of Richardson Scales for weighing molasses content feeds. But as molasses content increased, so did the time and effort required for cleaning.

Usually twice-a-day cleaning sufficed. But the higher the molasses content, the faster the feed adhered and built up on all platework. Downtime for cleaning went even higher.

Now Richardson Scale Company uses R/M "Teflon" sheets wherever molasses feed makes contact with the scales. Field experience proves that now scales never clog, cleaning requires only a moist sponge instead of a metal scraper and only 1/10 as much time as before.

R/M Bondable "Teflon"* Cuts Cleaning Time 90%

Do you have an application which can utilize the non-adhesive property and low coefficient of friction of "Teflon"? Talk to R/M—headquarters for "Teflon" rods, sheets, tapes, hose, machined parts, with or without bondable surfaces. Write for information or call your nearest R/M district office.

*Registered TM for Du Pont fluorocarbon resins

R/M

PLASTIC PRODUCTS DIVISION
RAYBESTOS-MANHATTAN, INC.
Manheim, Pa.

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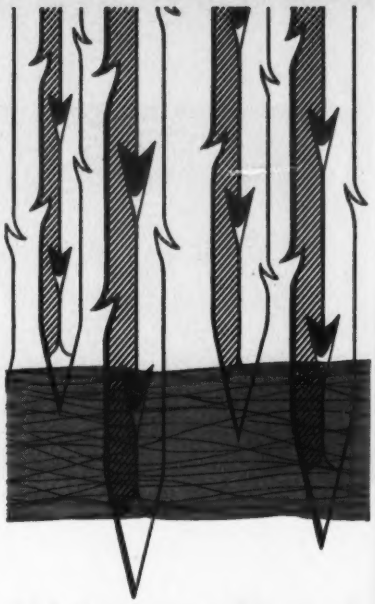
SPECIALISTS IN ASBESTOS, RUBBER, ENGINEERED PLASTICS, SINTERED METAL

Check 4825 opposite last page.



How can you use this *NEW* FILTER MEDIUM?

Before you consider costly, custom-designed filter media for your applications, check your requirements against the properties offered by Troyfelt:

Degree of Filtration: Down to One-Half micron
Temperature Range: Minus 50° to 300°F
Rate of Flow: From a trickle to thousands of GPM

The exclusive Troy process employed in the production of Troyfelt allows precise control of strength and porosity to meet your requirements. Troyfelt is formed from mechanically interlocked synthetic fibers which resist abrasion, withstand acid and alkali solutions and will not support bacterial growth.

Describe your filtration requirements and we will send samples of Troyfelt designed to meet your needs. For samples and descriptive literature, write today to; TROYFELT . . . by the pioneers in synthetic felts.

TROYFELT

INDUSTRIAL PRODUCTS DIVISION — TROY MILLS, INC.
200 Madison Avenue, New York 16, N. Y.

Check 4828 opposite last page.

density is 33 lb/cu ft, softening temperature is 240-254°F. Dart drop test for impact strength (ASTM D-1709-59T) indicates that a lighter weight film made with this resin has the same toughness as the heavier film made with general purpose resins. Films have an acceptable sealing coefficient between 260 and 465°F.

(Polyethylene resin MPE 706 is a product of Plastics Division, Monsanto Chemical Company, Springfield 2, Mass.)

Check 4829 opposite last page.

Liquid vinyl stabilizers give improved stability and stain resistance

Uses: Products are designed for stabilizing polyvinyl chlorides for better calendering, molding and extruding formulations.

Features: Single-package liquid vinyl stabilizers provide improved stability, color and stain resistance.

Description: Designated Metasap ABC-51 and -52, products are cadmium-barium-zinc liquids. Both products are light yellow in color. They provide optimum balance between initial color and long-term stability.

(Stabilizers ABC-51 and -52 are products of Metasap Div., Nopco Chemical Co., 60 Park Place, Newark 1, N.J.)

Check 4830 opposite last page.

"I try to discourage accidents."

Nalco Treatment Technique Protects Non-Wetted Cooling Tower Sections from Microbiological Attack

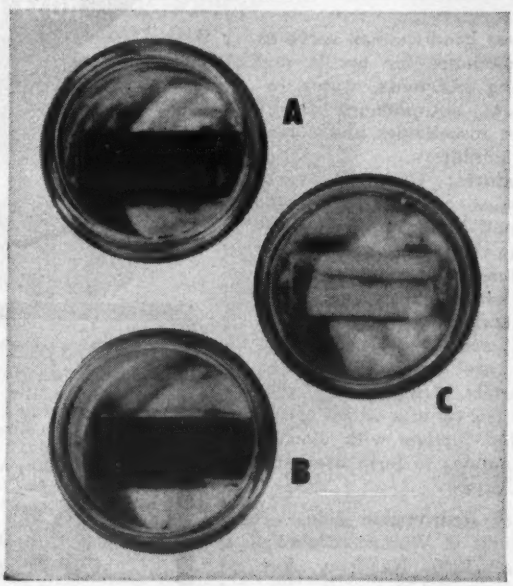
Simple, Low-Cost Method Delivers Effective Chemical to Non-Wetted Tower Areas

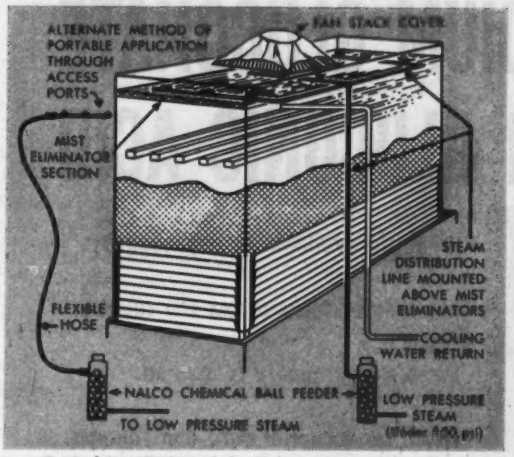
Tower sections above the water distribution level have presented a tough protection problem. Chemicals in the water rarely reach fan stacks, top decks, plenum chambers and mist eliminators in sufficient concentration to be completely effective. All of these areas are subject to damaging wood rot caused by microbiological attack. Consequently, a difficult manual spray method has been used to combat this problem. Nalco now recommends using a steam application method to carry powerful microbiocides into the non-wetted areas as a positive method of reaching *all* non-wetted surfaces. The technique is simple, low-cost, and has proved very effective in keeping non-wetted lumber rot-free.

How Steam Treatment Works

Fans are shut down, and fan stacks covered. It is possible to circulate water in the tower during steam treatment, but faster results can be had if circulation is also stopped. Low pressure steam is directed through a container of *Nalco* ball briquette microbiocide chemicals, which are carried with the steam. Perforated steam pipes, inserted into the plenum chamber, carry the steam chemicals into all spaces above the water distribution lines, permitting the chemicals to penetrate wood surfaces and providing protection against wood rot.

These test blocks were placed on a nutrient agar inoculated with a known wood rot organism. Test blocks A and B had been removed from a tower treated with Nalco steam spray. Test block C had not been treated. Notice extreme accumulation of fungal organisms on untreated block C.




ALTERNATE METHOD OF PORTABLE APPLICATION THROUGH ACCESS PORTS
FAN STACK COVER
MIST ELIMINATOR SECTION
STEAM DISTRIBUTION LINE MOUNTED ABOVE MIST ELIMINATORS
FLEXIBLE HOSE
COOLING WATER RETURN
NALCO CHEMICAL BALL FEEDER
LOW PRESSURE STEAM
TO LOW PRESSURE STEAM

Typical installation of the Nalco steam spray system.

Portable or Permanent?

A number of Nalco-treated cooling towers have been equipped with permanently-installed steam pipes for microbiological control. Others are treated with steam lines and feeding equipment which is put in place for treatment, but moved from tower to tower as needed. Either way, this Nalco technique is providing a degree of economical protection that controls the wood rot hazard, removing it from the list of operators' problems.

Follow-Through Assistance

Your Nalco Representative will be glad to give you details on how your cooling tower non-wetted sections can be protected effectively; and tell you whether your towers need this treatment now. If steam treatment is indicated, he will help set up the necessary equipment, supervise application to assure results, and make periodic checks on the continuing effectiveness of the treatment.

Chemical microbiocides used for steaming are compatible with other *Nalco* chemicals used in cooling towers for stabilization, water-borne microbiological control, and scale and corrosion control. Your Nalco Representative is an expert in this area, too . . . Use his knowledge and experience—backed by the world's largest water treatment service organization—to solve *all* your cooling water treatment problems. Call him today, or write direct, for Prints 264, 265 and 266 which define steam spray application.

NALCO CHEMICAL COMPANY
6294 West 66th Place • Chicago 38, Illinois

Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany
In Canada: Alchem Limited, Burlington, Ontario

Nalco. **. . . Serving Industry through Practical Applied Science**

Nalco CHEMICALS
Nalco SERVICES

Check 4831 opposite last page.

DAWE'S

a dependable source for

SODIUM GLUCONATE and GLUCONIC ACID

Promptly available in any quantity.

Warehouse stocks across the country.

Dawe's high quality is assured.

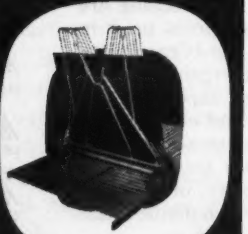
Write for technical data and samples.

DAWE'S LABORATORIES, INC.
4800 South Richmond Street
Chicago 32, Illinois

Dawe's

Check 4832 opposite last page.

SICON PROTECTS even in HOT OVENS



Young Brothers Co., Cleveland, a leading manufacturer of industrial ovens for the metal decorating field, uses SICON finish to protect oven wickets. Printed metal sheets are oven-dried before being formed into signs, cans, etc. As they pass through the 100 ft. oven the Sicon-coated wickets hold them in position as shown. SICON has proved most satisfactory because it keeps wickets clean, rust-free, and unaffected by temperatures in the 400°-600°F. range. Why not try SICON on your product! Write Dept. G-3.

Sicon®
Hi-Temperature Finish
by MIDLAND
Industrial Finishes Co.
Waukegan, Illinois

Check 4833 opposite last page.

CHEMICAL MATERIALS

Fluoro-elastomer takes temperature range of —40 to 600°F

Material resists corrosives, fuels and lubricants

With a maximum operating temperature range from —40°F to 400°F continuous service and 600°F intermittent use, fluoro-elastomer is supplied as tube, hose and press-polished sheets. Material resists corrosive chemicals, fuels and lubricants and is reported to have excellent resistance to oxidation and weathering.

Designated Fluran F-5000, material can be supplied in hardnesses of from 60 to 95 on the Shore A scale. At room temperature, tensile strength ranges from 2000 to 3000 psi and ultimate elongation varies from 100 to 400%. Held compressed for 70 hr at 250°F, material recovers to within 90 to 97% of its original dimensions.

(Fluran F-5000 is a product of Plastics & Synthetics Div., U.S. Stoneware Co., Akron 9, Ohio.)

Check 4834 opposite last page.

Combine reactive OH, NH, long chain fatty groups in hydroxamic acids

Uses: Products can serve as intermediates for textile and tanning assistants, water repellents, antioxidants, plasticizers, insecticides and corrosion inhibitors.

Features: Chemical intermediates contain a reactive OH and NH group as well as a long chain fatty group. They can react with alkalis, metallic ions and acylating agents.

Description: Fatty hydroxamic acids, oleyl and C_{16}-C_{18}, are off-white waxy materials. On heating they form isocyanates which can be reacted further with alcohols and amines to form urethanes and ureas.

(Fatty hydroxamic acids are products of Woburn Chemical Corp., 1200 Harrison Ave., Harrison, N.J.)

Check 4835 opposite last page.

Leak Lock STOPS LEAKS *where other compounds fail!*

Here's a simple, economical solution to many troublesome leaking joint problems. Leak Lock holds LP, gasoline, oils, gases, petro-chemicals and refrigerants that eat through ordinary joint compounds. Its remarkably tough, highly adhesive, remains flexible indefinitely . . . the joint compound that stretches rather than breaks. Years of use have established its advantages in stopping wasteful or hazardous leaks in the petroleum, chemical, atomic energy, electronic, refrigeration and other fields.

Listed by Underwriters' Laboratories for Gas and Oil Equipment List: Also for Propane and Butane.

For free sample, write on letterhead giving us the name of your local Industrial Distributor.

HIGHSIDE CHEMICALS INCORPORATED
16 Colfax Avenue • Clifton, N. J.

Check 4836 opposite last page.

Don't throw maintenance money away!

NoDrip TAPE PERMANENTLY PROTECTS AGAINST CONDENSATION AND RUST AT LOWEST COST.

Any maintenance man can check this. Handy 16' rolls of ¼" thick NODRIP TAPE fits any size pipe or fitting. Never absorbs moisture. *Permanently* insulates against damaging pipe sweating—even around unions, tees, angles and valves.

NoDrip PLASTIC COATING

Another fine Mortell product. Use on metals, concrete, brick, tile, plaster surfaces. Apply by brush, trowel or spray to large pipes, tanks, walls, ceilings, air ducts, to eliminate sweating. 1 or 5 gal. cans or 55 gal. drums.

At all leading hardware, mill supply and plumbing jobbers. For full information and technical handbook, write

Mortell COMPANY
530 Burch Street, Kankakee, Ill.

Check 4837 opposite last page.

NEW LITERATURE

Chemical Materials

Polyethylene glycols are comprehensively investigated in 65-page booklet. Included is information on physical properties; solubilities; specification limits; test methods; storage, handling, and shipping; toxicological properties; and selected literature references. "Carbowax polyethylene glycols" — Union Carbide Chemicals Co., Division of Union Carbide Corp.

Check 4838 opposite last page.

A reference guide to silicone; this attractive two-color brochure is abundantly illustrated with photos and charts to enable the user to quickly decide what silicone compound will fit his application. Publication of 16-pages discusses silicone rubber for insulation, fabricated parts, encapsulating, varnishes and coatings. "Silicones for the Space Age" — Silicone Products Dept., General Electric Co.

Check 4839 opposite last page.

Polyester resins are described in 12-page booklet that includes characteristics, fabricating procedures and end uses. Special resins are recommended for fire resistance, flexibility and a protective surfacing. "Polyesters Resins Selector" — Plastics and Resins Division, American Cyanamid Co.

Check 4840 opposite last page.

Aluminum sulfate's properties and uses receive 40-page treatment in reference handbook. Major feature of booklet is series of convenient conversion charts. Also included are standards and specifications for alum for water and sewage treatment of the Federal Agencies and of the American Water Works Association. Aluminum Sulfate Bul — Stauffer Chemical Co.

Check 4841 opposite last page.

Polypropylene's versatility and market potentials are underscored in report dealing with properties and characteristics of the material. Extensive technical details are presented. Tenite polypropylene report — Eastman Chemical Products, Inc., Subs. of Eastman Kodak Company.

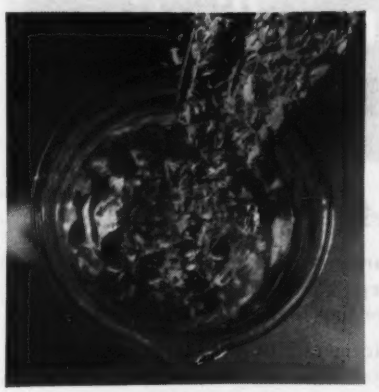
Check 4842 opposite last page.

Thorium, yttrium, metals and alloys of the rare earth group elements are discussed in eight-page brochure which describes manufacture and lists detailed properties and chemical analysis of more than 50 products. "Rare Earths, Thorium" — Vitro Chemical Co., Div. of Vitro Corp. of America.

Check 4843 opposite last page.

BRIEFS

some talk about sodium sulfide
- **sodium sulfhydrate**
- **sodium chlorate**
- **thionyl chloride**



SODIUM SULFIDE... NO SETTLING REQUIRED

We put up sodium sulfide in small flakes so you get a faster dissolving action, even in cold water. You do away with settling and filtering, since the clear water solutions show no appreciable sediment.

The total sodium sulfide content is 60-62% with 35% water of crystallization. The chemical is relatively free from salt impurities. Iron content is 8 ppm maximum.

Check the coupon if you would like to learn more.

6 POUNDS OF SODIUM SULFHYDRATE DO 10 POUNDS OF WORK

These *six* pounds of sodium sulfhydrate give as much sulfidity as *ten* pounds of sodium sulfide, and about half the alkalinity.

A little quick arithmetic will show you that you'll need 40% *less* sodium sulfhydrate to do the same job. So you will have to buy and store that much less chemical. Like our sulfide, the sulfhydrate is also completely and rapidly soluble in cold water and can usually be used without filtering or decanting.

This sodium sulfhydrate assays 70-72% with water of crystallization at 18 to 26%. Iron content is held to 5 ppm or *lower*.

You can find out more by returning the coupon.

SODIUM CHLORATE... 99½% PURE

That's the purity of our sodium chlorate in the technical grade.

Hooker sodium chlorate is available in the form of white crystals. It's very soluble in water and is a very strong oxidizing agent.

Our sodium chlorate is used as a source of chlorine dioxide and as an oxidizing agent in dye manufacture and metallurgy.

You also have a choice of shipment: steel drums of 100, 450, 600 pounds net or in tank cars of 80,000 or 100,000 pounds bulk, minimum weight.

Want more facts? The coupon will bring you data.

HAVE A NEED FOR THIONYL CHLORIDE?

You can use our thionyl chloride in organic synthesis to replace with chlorine various groups such as OH, SH, SO_2, H or O. It's especially useful in making organic acid chlorides and anhydrides.

Thionyl chloride reacts with hydroxyl groups in organic compounds to form gaseous by-products, SO_2 and HCl, which can be easily removed.

Thionyl chloride is available in two grades to give you the purity needed: 98% for the refined and 93% for the technical.

It can be used to introduce sulfur alone or a sulfur-oxygen combination ... and as a chlorinating agent in the manufacture of isoamyl chloride, synthetic pyrethrum, phenyl propyl chloride and synthetic vitamin A palmitate.

As a start to using it yourself, send the coupon, and we'll send you our thionyl chloride data sheet and Bulletin 328-B, Hooker Chlorinating Agents, a 20-page brochure on reacting thionyl and other chlorinating agents.

For more information, check the chemical you're interested in and include your name, title and firm address.

- ☐ Sodium sulfide
- ☐ Sodium sulfhydrate
- ☐ Sodium chlorate
- ☐ Thionyl chloride, data sheet and Bulletin 328-B

HOOKER CHEMICAL CORPORATION

507 Forty-seventh Street, Niagara Falls, New York

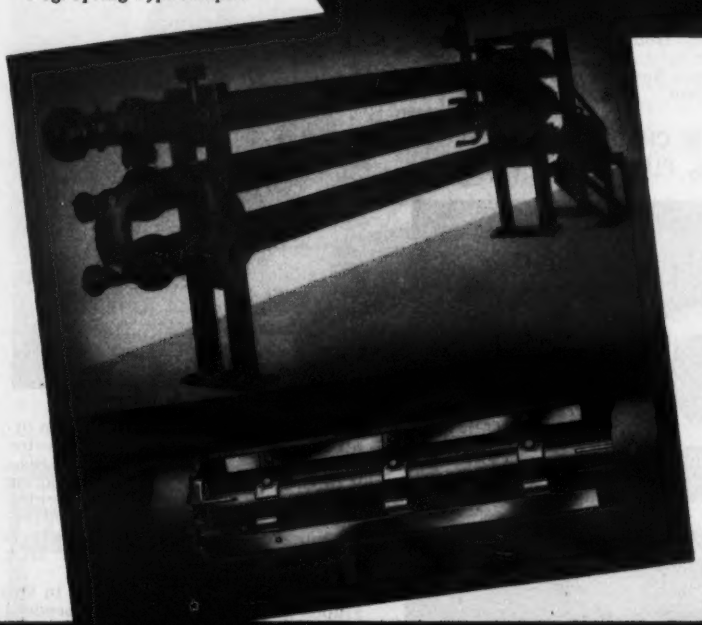
Sales Offices: Buffalo Chicago Detroit Los Angeles New York Niagara Falls Philadelphia Tacoma Worcester, Mass.
In Canada: Hooker Chemicals Limited, North Vancouver, B. C.

HOOKER CHEMICALS PLASTICS

Check 4844 opposite last page.

Vogt EXCHANGERS Solve Heat Transfer and Crystallization

BELOW: *A scraped surface unit for production of Para-Xylene by fractional crystallization. Insert shows detail of Vogt Spring Type Scraper.*



. . . And Here's How:

1. Rotating scraper action continuously sweeps surfaces clean even while processing highly adhesive materials.
2. Uniform rate of heat transfer keeps crystallization under control and discharges crystals as a slurry.
3. Product is thoroughly mixed by scraper blades as it flows.
4. Closed, pressure-type system permits use of flammable, volatile and expensive solvents with complete safety and no solvent loss.
5. Units fabricated from a broad range of materials to suit process stream characteristics.

Write for Literature. Address Dept. 24A-XCP

Listed here is a wide variety of materials which have been successfully processed with Vogt Scraped Surface Exchangers in the chemical, petro-chemical, petroleum and related industries.

Benzene Hexachloride
Caustic Soda
Caustic Potash
Clay
Cylinder Stock
Para-Dichlorbenzene
Fatty Acid Solutions
Fish Oil
Linseed Oil
Naphthalene
Paratone & Solids
Phenolic Resins
Polyester Liquid
Pressed Distillate
Reduced Petroleum
Waxy Oil-Solvent Mix
Soybean Oil
Sperm Oil
Sugar Syrup
Sulfur-Oil Mix
Sulphate Solution
Tall Oil-Naphtha-Sulfuric Acid Solutions
Tetrachloro Benzene
Viscose
Wax Slurry
Para-Xylene

HENRY VOGT MACHINE CO.
Louisville 10, Ky.

Check 4845 opposite last page.

CHEMICAL MATERIALS

Styrene-maleic anhydride copolymers are discussed in eight-page brochure detailing chemical and physical properties and potential applications. SMA Resins Bul — Texas Butadiene & Chemical Corp.

Check 4846 opposite last page.

Alkali-soluble acrylic copolymer for textile sizing is subject of technical bulletin covering physical properties and application methods. Bul T-6C — Polyvinyl Chemicals, Inc.

Check 4847 opposite last page.

Several unusual fluorine compounds are listed in pocket-size catalog of eight pages. Antimony trifluoride and titanium tetrafluoride are of particular significance. "Fluorine Compounds" — Ozark-Mahoning Company.

Check 4848 opposite last page.

Refined paraffin waxes are detailed in four-page file folder that contains a comprehensive listing of uses for fully refined paraffin and microcrystalline waxes. Complete specifications are given. "Amsco Waxes" — American Mineral Spirits Company.

Check 4849 opposite last page.

A comprehensive list of chemical intermediates and research chemicals, together with complete specifications, make up 62-page "Product Data" plastic ring binder — Benzol Products Company.

Check 4850 opposite last page.

Heat resistant laminate, Snythane AA-HT, is detailed in technical data sheet of two pages. Typical property values and operating range recommendations are given. Bul TD2 — Synthane Corp.

Check 4851 opposite last page.

Epoxy casting and adhesive resins receive treatment in two-page technical bulletin. Typical properties are listed together with a method for adjusting flexibility. "Epoxy Casting and Adhesives Resins of Adjustable Flexibility" — Isochem Resins Company.

Check 4852 opposite last page.

Fungicidal and bactericidal agents for textiles, organics, paper, latex and other plastics are subject of 16-page brochure which describes characteristics of these non-volatile, chemically stable and non-irritating preservatives. Information given includes technical data, shipping specifications, preparation and properties of solutions and toxicity data. Bul AP-96 — Antara Chemicals Div., General Aniline & Film Corporation.

Check 4853 opposite last page.

Just like a 'one-two punch' — Electrostatic precipitator teams up with wet scrubbers at pulp mill and . . .

• KO's air pollution
• Recovers 32 tons chemicals per day

KARL ROBE, Editor West
with **CLAUDE STITT,** Plant Manager
PAUL J. OLSEN, Project Manager No. 3 Mill
R. O. MEYERS, Plant Engineer
J. CHALLAS, Technical Director
San Joaquin Mill, Fibreboard Paper Products Corp.

Problem: When Fibreboard Paper Products Corp. decided to build a third production line for Kraft linerboard at their San Joaquin (East Antioch, California) mill, air pollution control was an integral part of design considerations.

The 400-ton Babcock & Wilcox recovery boiler for the line was to burn 1,245,000 lb of black liquor solids per day. The mill's black liquor is primarily lignin dissolved from wood, plus sodium chemicals, and is burned at approximately 65% solids concentration.

Most of the inorganic solids (about 95%) settle to bottom of recovery boiler and are returned to causticizing plant for reuse after suitable treatment.

Sodium and sulfur compounds are discharged with flue gas, and these could cause odor and other problems to the downwind agricultural community east of the plant.

Solution: When the recovery boiler went into operation in August 1960, it was equipped with an electrostatic precipitator coupled in series with water-spray stack-gas scrubbers.

Dust-laden flue gases pass through precipitator between rows of negatively-charged wires and grounded collecting plates. A one-way, high-voltage electrostatic field set up between these electrodes ionizes the flue gas.

Ionization takes place near negative wire. Negative ions must travel to grounded plates, and during travel they attach themselves to dust particles in effluent stream.

When charged particles reach positive plate, they adhere until rapped loose and drop by gravity to liquor reservoir below. Plates and wires are rapped automatically at regular intervals by vibrators.

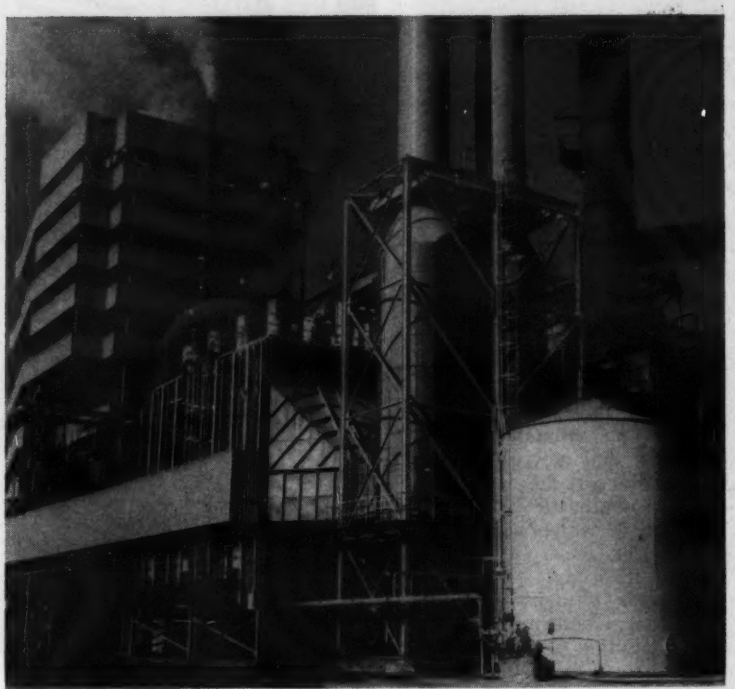
A constant liquid level is maintained in reservoirs by adding make-up black liquor and recirculating excess liquor to recovery boiler.

The 34-ft-high precipitator is made of hollow, acid-proof, glazed tile reinforced internally with steel and concrete. Unit is 41 ft wide and 43 ft long. It has two chambers in parallel containing 44 lanes of electrodes in four series fields, separately energized.

Power is supplied by three double half-wave silicon power units. These draw approximately 40 to 50 kva per unit in continuous operation. Each has an automatic regulator which adjusts power input to optimum cleaning efficiency ratio.

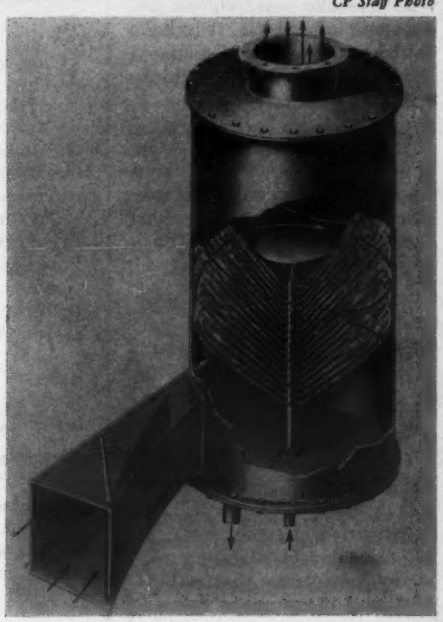
Scrubbers Next

Each of the two precipitator chambers discharges to a wet-stack scrubber. Dust loading



CP Staff Photo

At Fibreboard's East Antioch, California, pulp and board mill, exhaust from 10-story recovery furnace (left) travels through 4-story high precipitator, which removes 99.5% solids from flue gas; thence through the two wet scrubbers with tall light-colored stacks (right) where 80-90% of remaining particles are removed



Effluent from precipitator enters scrubber tangentially, swirls upward through water sprays

to scrubbers is 0.01 to 2.1 grains per cu ft. Pressure drop is about one inch wg.

Hot gas from precipitator enters scrubber tangentially and is impacted against a liquor spray (see diagram). Gas continues to spiral upwards, depositing droplets of water, containing the dust particles, against circular wall of unit. Liquid flows by gravity to reservoir below. Clean, moisture-free gas passes out top of scrubber.

Fluid collected at bottom is pumped to spray manifold and recirculated at rate of 400 to 500 gpm at 60 psi. Proper liquid level is maintained by overflow or by adding make-up water through manually-set globe valve.

Scrubbers are made of type-316, ELC, stainless steel to withstand corrosive action of recovered sodium salts. Each unit is 12 ft diam, 42 ft high, and has capacity of 78,500 cu ft of 280°F flue gas.

Results: Precipitator, which removes an estimated 99.5% of solids, and wet scrubbers, which take out 80% or more of remaining particles, recover a total of 32 tons of soda compounds for reuse in pulping process each day.

Flue-gas effluent is clean and clear, conforms to Bay Area Pollution Control Board regulations.

(Electrostatic precipitators are product of Metal Products Division, Koppers Company, Inc., PO Box 298, Baltimore 3, Md.)

Check 4854 opposite last page.

(Further information about Chemico gas scrubbers may be obtained from Chemical Construction Corp., 320 Park Ave., New York 22, N.Y.)

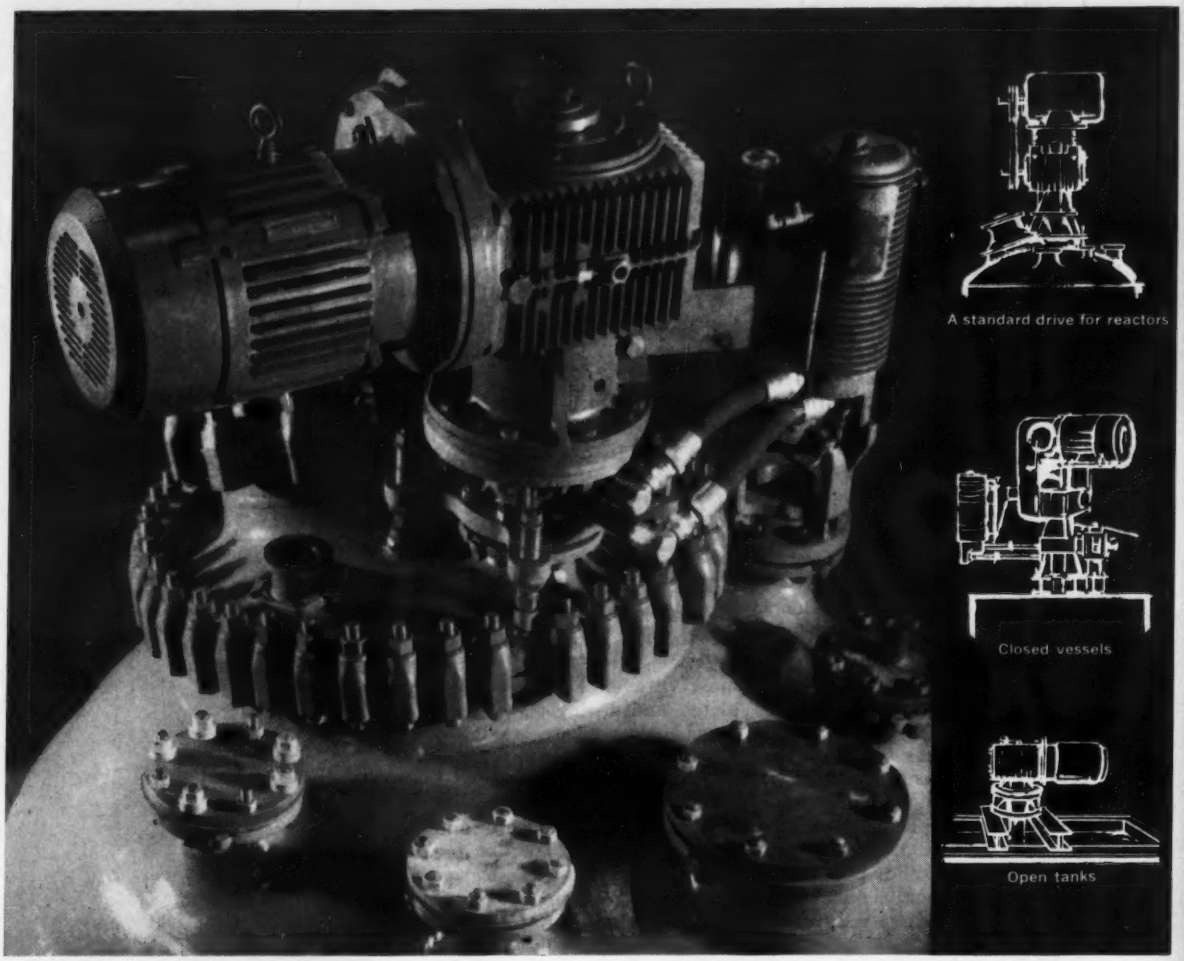
Check 4855 opposite last page.

Instant defoaming achieved with simple sonic device

Uses: Destroying foam in tanks, reactors and other vessels.

Features: Device uses air jet to generate high intensity sound waves that shatter bubbles and disintegrate foam in

FLUIDICS* AT WORK



It's a "compact" from Pfaudler . . . the new and versatile TW Drive

One look. That's all it takes to show you that this new Pfaudler® TW Drive truly deserves to be called a "compact."

The model pictured is the 7½ HP, Fixed Speed Gear, 5TW, mounted on a Pfaudler Glasteel reactor. Note how the compact, integral assembly serves as both drive support and housing for seal or stuffing box.

Note, too, the absence of bulky supports or other obstructions. Thus, lots of head room and easy access to top-head openings.

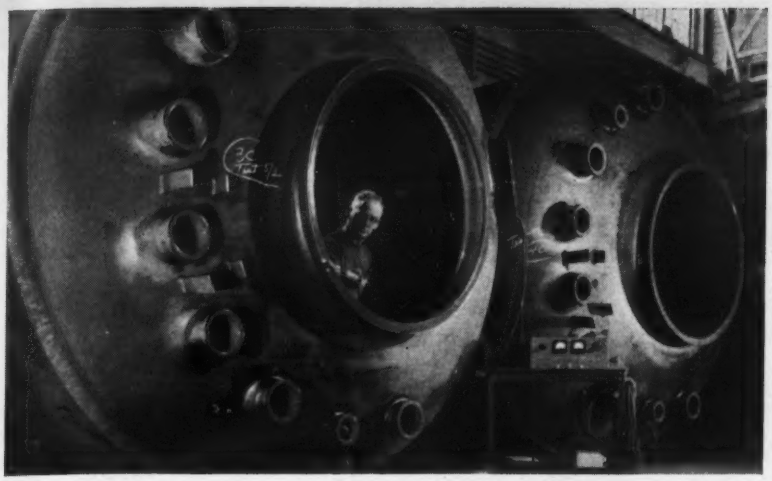
Versatile. Though it's small in size compared with many types of drives, the TW series can solve a variety of your agitation problems. You can use a TW on glassed steel or stainless steel reactors and on many of the agitated vessels in your plant. Open vessels need only a bridge for support. Closed vessels call for a standard nozzle with commercial pipe flange, plus support bosses.

Wide choice. Name the type of drive best suited to your application—fixed-speed gear, fixed-speed belt, variable-speed belt, variable-speed hydraulic. The TW is available in all of these types, in a complete range of agitator speeds and horsepower capacities.

It's a wise choice for your *standard* plant drive.

Common to all TW's, along with compactness are the following: (1) Maximum power for space and weight—because both worm and gear of speed reducer are throated for a larger contact area, (2) Quiet operation—since the large area of tooth contact assures accurate meshing and eliminates distortion, (3) Minimized agitator deflection—because where bending moment is greatest a large shaft diameter has been provided, (4) Long service life for seal and stuffing box parts. Housing serves as an integral part of the drive, so variations in deflection between component parts are minimized.

Summing up. The new "compact" TW Drive is one of a complete line of Pfaudler drives that offers economical, efficient answers to many of your agitation problems. Details are included in Bulletin 1001. For your copy, write to the address indicated on the facing page.



Glasteel reactors guaranteed full year against corrosion

This man is electric testing the interior of a Glasteel reactor. He's making sure that the product-contact surface is completely covered with corrosion-resistant Pfaudler glass.

That's the *glass* in Glasteel. The *steel* is outside, for working strength. Fusing the two together gives you a combination that lets you forget—not fight—corrosion.

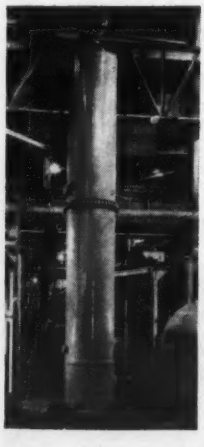
You can use Glasteel safely with all solutions of all acids except HF to 212° F (even up to 450° F for certain acid solutions, depending on concentration) and with many alkalies at moderate temperatures.

And you can do so confidently because Pfaudler Glasteel equipment is guaranteed against corrosion for a full year after shipment, when used under operating conditions specified and approved. If rendered unusable by chemical attack during this period, Pfaudler will repair or replace it, fob, factory.

Glasteel is also inert; it won't influence quality, flavor, color or purity of your products. And its smooth, abrasion-resistant surface resists build-up. So heat transfer is not impeded and cleaning is both quick and complete.

Standard Glasteel reactors are available with capacities from 5 to 4,000 gallons. Custom designs go to 10,000 gallons and larger. You can also get a variety of other process equipment made of Glasteel.

For details on reactors, ask for Bulletin 988. To bring your files up to date on *Glasteel*, it's Bulletin 985. Write to the address below.



Can you use a 32-foot-high, agitated, Glasteel polymerizer?

This one was recently installed in a leading U. S. petroleum refinery. It will be used in producing polyethylene resin. We made it to the customer's specifications.

We also made the two-piece Glasteel agitator that's approximately 24 feet in length. The agitator sections are joined by carbon steel flanges, protected from corrosive attack by a Hastelloy shroud sealed with Teflon packing. Despite the unusual length, the agitator has no step bearing.

We commend this vessel to your attention for two reasons: It shows how we combine materials for optimum performance. And, equally important, it's a good example of the BIG process equipment Pfaudler makes to meet your special needs. Your inquiries are invited.

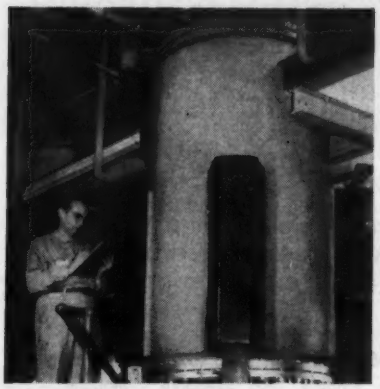
How tantalum helped Hoffmann-LaRoche scale up production

Here's the problem: You're making a relatively new drug, using a process that requires holding a mixture of phosphoric and hydrochloric acids at 385° F for several days.

You've been turning it out on a pilot-plant basis, using flasks. Market conditions require that you get into full-scale production. How?

The nature of the corrosive reaction narrows your choice to three materials: tantalum, gold, and platinum.

That's the situation Hoffmann-LaRoche Inc., Nutley, New Jersey, was up against recently. The practical answer: a 275-gallon, tantalum-lined reactor made by Pfaudler.



We say practical because tantalum is essentially inert and does not combine with the process ingredients to cause contamination. Practical because tantalum resists most acids, even at elevated temperatures. Practical because a .020" tantalum liner in a 5/16" carbon steel shell is reasonably priced.

And, finally, practical because Pfaudler brings to the fabrication of such equipment a wealth of experience and capability. We can and do work with tantalum, titanium and zirconium, so that you can look to these metals to solve your corrosion problems.

More facts? Bulletin 978 summarizes our activities in the "refractory" metals. We'd be happy to send you a copy.

Address all inquiries to: Pfaudler Division, Department CW-71, Rochester 3, New York.

*FLUIDICS is the Pfaudler Permutit program that integrates knowledge, equipment and experience in solving problems involving fluids.

PFAUDLER PERMUTIT INC.

Specialists in FLUIDICS . . . the science of fluid processes

Check 4856 opposite last page.

matter of seconds. Unit is contructed of stainless steel and has no moving parts.

Description: Defoamer is mounted near layer of foam that is to be collapsed. Compressed air at 30 psi or higher is connected to the device. When foam is not generated

Photo sequence illustrates how sonic device (mounted on top of column) destroys foam in two seconds

fast enough to warrant continuous defoaming, an electric-eye detector may be incorporated to actuate the device.

In general, defoamers are located six to 10" above liquid level. Number of units needed depends upon nature of material being processed. Each device is furnished with its own air pressure regulator. Air consumption is about 15 cfm.

Foam bubbles are subjected to pressures that alternate 12,000 times per second between more than 30 psi and close to vacuum. In a typical installation, a column of foam three ft high can be collapsed in two seconds. Cost of defoamer is approximately $275.00.

(Air-jet sonic defoamers are product of Teknika, Inc., 734 Asylum Avenue, Hartford 5, Conn.)

Check 4857 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

EASTERN PORTABLE MIXERS

especially designed for small batch processes

offer . . . precise mixing results with long term cost savings

Eastern Portable Mixers are especially designed for dependable, low cost service in small batch processes. Where fixed mounted installations are not required, Eastern's Portables offer greater versatility, ease of handling, and long term cost savings.

Speeds of 420, 1125, and 1725 R.P.M. rated from 1/20 to 3 H.P. are standard, with variable speed and air-driven models also available. Motors in all standard types can be supplied in semi-enclosed, totally-enclosed, or explosion-proof construction. Shafts and single or dual propellers are available in a choice of alloys for all service requirements. New optional ball-swivel clamp as illustrated, permits easy adjustment of mixer position in tank.

For a personalized analysis of your mixing problems, send details to Eastern engineers. A recommended solution will be furnished promptly and without obligation. For a helpful guide to mixing fundamentals, write for "Handbook of Fluid Mixing."

NEW PORTABLE MIXER BULLETIN

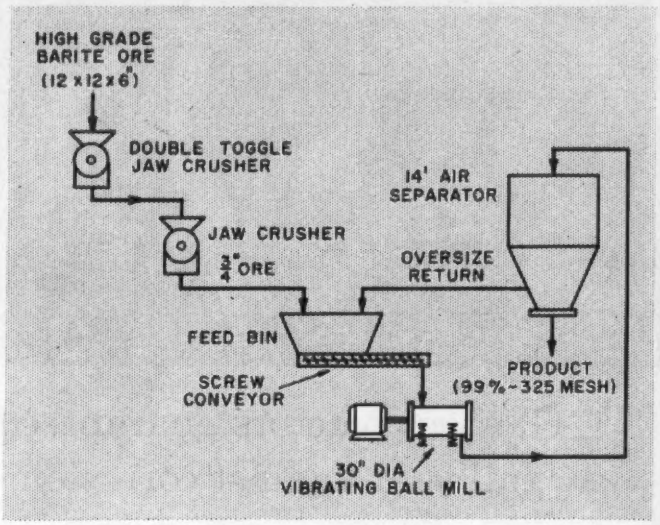
Eastern's improved line is included in the revised Portable Bulletin No. 530-A.

Eastern

INDUSTRIES, INC.
MIXER DIVISION
Regent Street
East Norwalk, Conn.

Check 4858 opposite last page.

PROCESSING EQUIPMENT



Vibrating ball mill plays key role in barite processing plant. As part of closed system, unit can continuously produce 2200 lb per hr of −325-mesh material from −¼" feed

Small but mighty — economical 30"-diam vibrating ball mill at Industrial Minerals . . .

• Speeds barite processing
• Slashes operating costs

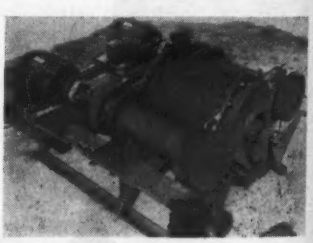
IMPROVED and more-economical grinding of barite ore is being accomplished through the use of an efficient 30"-diam vibrating ball mill at Industrial Minerals Inc., Kings Creek, N. C. Although size of the equipment is relatively small (unit complete with motors and integral base frame occupies only 64 sq ft), its throughput is impressive. Approximately 2200 lb per hr of 99% −325 mesh material is being continuously turned out by the machine, which is fed −¾ lumps.

A NEW SOLUTIONS FEATURE

Grinding barite to such small particle sizes isn't easy. Product is soft and friable, but has a surprisingly high bulk density. Consequently, the equipment takes a tough beating . . . it must be rugged and dependable for this kind of service.

Try Small Mill First

Until recently, a conventional mill was used at the plant, with varying degrees of success. As an experiment in "operations improvement", company installed a small vibrating ball mill as part of a continuous, closed-circuit, processing system. The 800-lb-per-hr output from this 15"-diam machine almost im-



Pre-installation photo shows dual motor and other components of 30"-diam mill. Compact machine measures only 7'1" x 9'6½" x 7'1" high

mediately slashed cost figures for operation and maintenance. However, the unit could not keep up with rapidly expanding production demands.

Early in 1960, the small vibrating mill was replaced by the larger 30″-diam machine. Although capacity of grinding chamber is only 12 cu ft, production schedules were met.

Powered by two 50-hp motors, mills of this type are said to be able to handle 15 to 30 times the throughput of conventional tumbling-type mills have same size grinding chamber. Initial cost is at least one-third lower than that of any other mill of equal production capacity, according to manufacturer.

Steel Ball Media

The mill consists essentially of a spring-mounted cylinder with dual eccentric mechanisms running horizontally along each side. Steel balls, measuring 1 x 1¼″, are used as grinding media. A total of 1¼ tons occupies 80% of the grinding chamber.

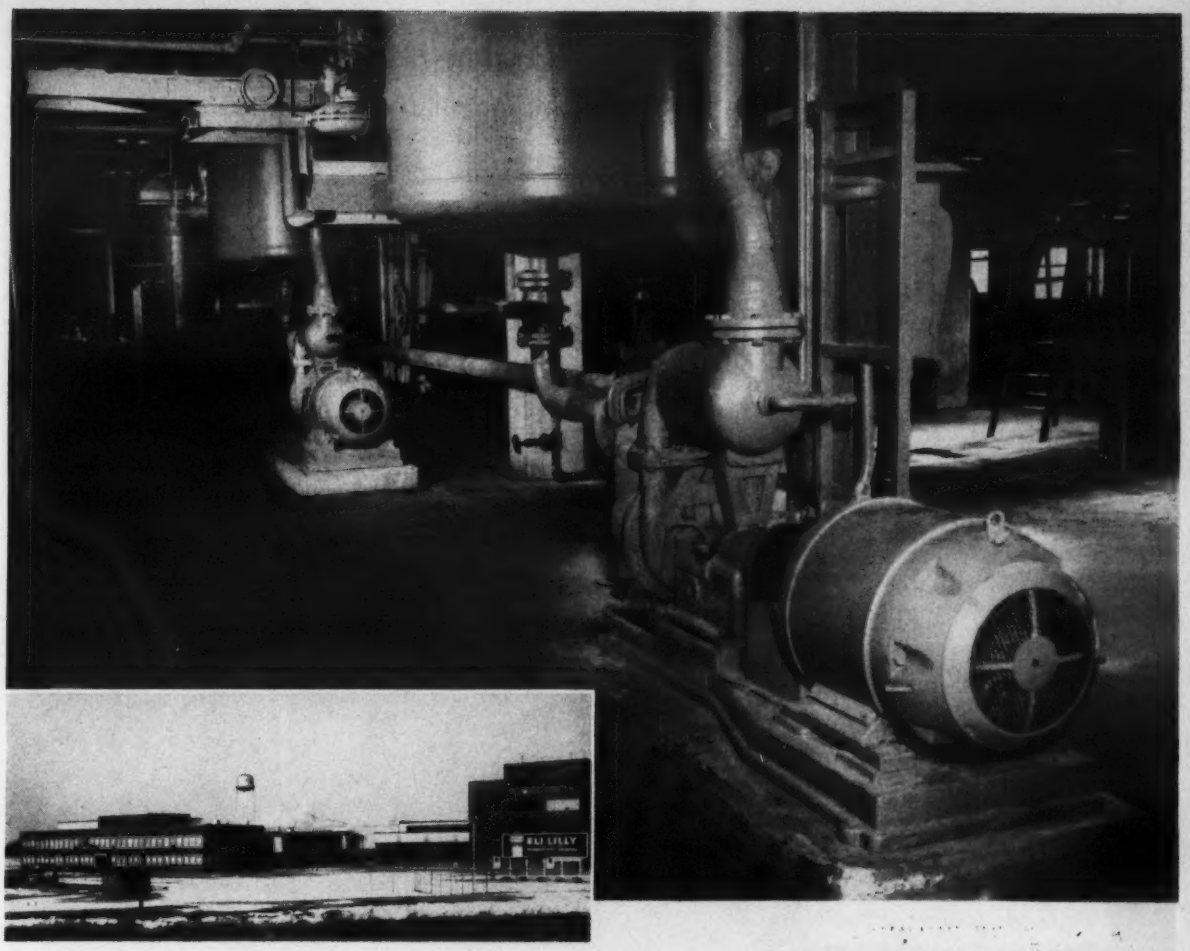
In operation, grinding charge vibrates at high speed. Balls carom off each other as well as off liners of grinding chamber. Combination of high-percent grinding-media loading plus mass rotation and multiple impact results in peak grinding efficiency. All wearing parts are easily replaceable. Machine's simple design assures easy maintenance.

Part-time Operator

The mill at Industrial Minerals, Inc., as part of a closed system, operates continuously two shifts per day. Only part-time operator attention is required. The −¾″ high-grade barite-ore feed contains about ½% moisture. Feeder and screw conveyor transfer the coarse barite to the vibrating ball mill for final size reduction. (Shown on page 68.)

From the mill, the finely ground product passes into a 14′ Raymond air separator. Oversize material is returned to mill's feeder. Finished product is ready for packaging and shipping.

Amount being recirculated



They Knew What They Wanted

There are 28 LaBour pumps in this modern plant of Eli Lilly and Company's Tippecanoe Laboratories at Lafayette, Indiana. They handle ethers, alcohols, acids, caustics, petroleum products, antibiotic solutions—a wide variety of liquids under a wide variety of conditions.

LaBour pumps were chosen for these exacting duties because Lilly had used LaBours in its Indianapolis plants. Fourteen LaBours were installed when the Tippecanoe operation was begun, and then when facilities were expanded some four years later, they put in fourteen more.

Men who have had actual experience with LaBour service and dependability almost invariably specify LaBours for expansion or replacement. If you haven't had the opportunity to see LaBours in operation on a tough job, write us for facts you ought to know about LaBour performance.

ORIGINAL MANUFACTURERS OF THE SELF PRIMING CENTRIFUGAL PUMP

LABOUR

THE LaBOUR COMPANY, INC. • ELKHART, INDIANA
WHITE PIGEON, MICH. • LONDON, ENGLAND

Check 4859 opposite last page.

is controlled by power drawn by the vibrating mill. In effect, this makes mill self-regulating. During normal operation, product is recirculated at about a 5-to-1 ratio.

(Vibrating ball mills are manufactured by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.)

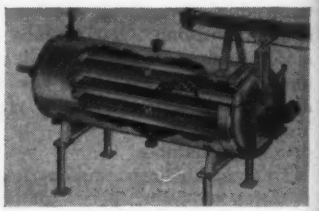
Check 4861 opposite last page.

Stop cake loss with horizontal tray filter

Trays can be removed by hand and dumped

Uses: Filtering liquids and slurries.

Features: Horizontal trays in filter permit complete recovery of solids. Trays can be easily removed by hand and dumped. If desired, drying of solids under vacuum can also be accomplished in unit.



Trays in horizontal filter have false bottoms and screens which can act as filter medium or as support for filter cloth or paper

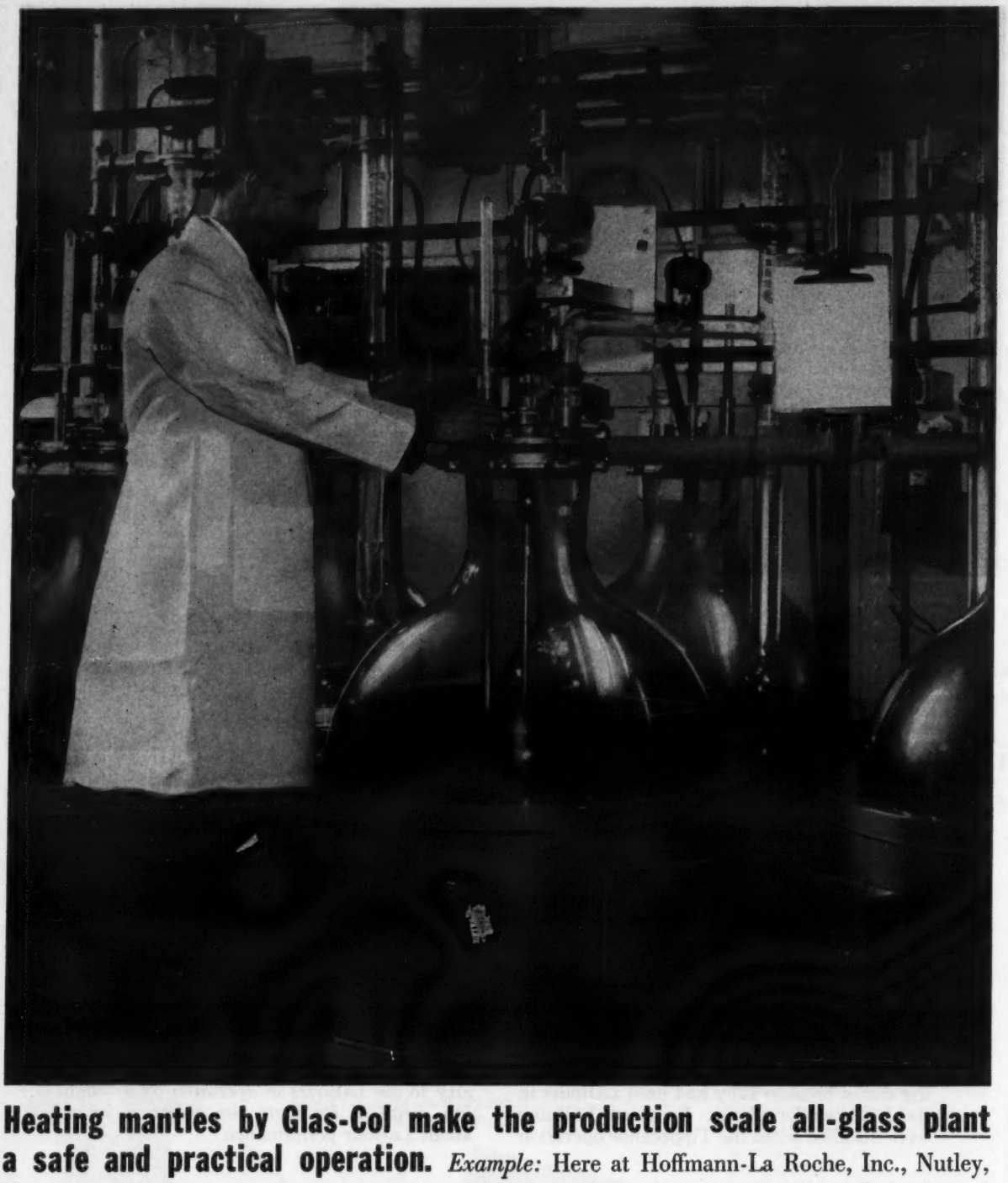
Description: Filter consists of series of trays arranged vertically in horizontal tank which opens at one end. Trays have false bottoms and screens which act as filter medium or as support for filter cloth or paper.

In small units, trays can be removed by hand. On larger machines, trays are part of an integral unit that can be rolled out on a monorail and then rotated to drop cake into hoppers or carts.

Filter may also be designed so that trays rotate inside tank, permitting cake to drop into built-in hopper bottom.

(Horizontal-tray filter was developed by T. Shriver & Company, Inc., 910 Hamilton Street, Harrison, New Jersey.)

Check 4862 opposite last page.



Heating mantles by Glas-Col make the production scale all-glass plant a safe and practical operation. *Example:* Here at Hoffmann-La Roche, Inc., Nutley, New Jersey, high purity pharmaceuticals are being produced in giant 200-liter flasks heated by six Glas-Col heating mantles. They have been in round-the-clock service for several months. Glas-Col has pioneered in the development of safe, dependable electric heating mantles for every use. Ask for bulletin or tell us your specific heating problem. Information on all-glass plants can be obtained from Corning Glass Works. For heating mantles . . . Glas-Col, of course.

Glas-Col Apparatus Company / *Dept. CP, 711 Hulman St., Terre Haute, Indiana*

Trademark Registered U. S. Patent Office. U. S. Patents . . 2,282,078 . . 2,739,220 . . 2,231,506 . . and 2,739,221

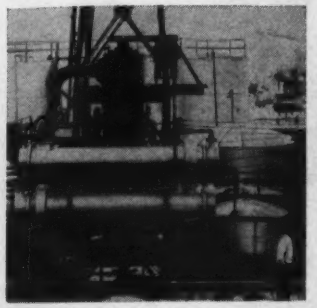
Check 4860 opposite last page.

▸ A NEW SOLUTIONS ARTICLE

Turbulent-film evaporator streamlines refining of sodium sulfonates

Simplifies control, saves space, cuts maintenance

Problem: Refining thick, viscous sodium sulfonates was a slow and difficult operation at Pennsylvania Refining Company in Karns City, Pa.



Thin-film evaporator (center background) processes 10 gpm of sodium sulfonate solutions at Pennsylvania Refining Co. This is more than combined output of three batch stills that the unit replaced

The three conventional batch stills used for this purpose occupied a large amount of space and required rigid operator attention to keep functioning properly.

Temperatures were difficult to maintain. The stills caused annoying surges of power, heat and water (especially during startup). Circulating pumps serving the stills took a beating too. The viscous products resulted in excessive wear and led to frequent pump failures.

Solution: Investigation indicated that better efficiency and substantial advantages could be realized by replacing the three old stills with a continuous-type, turbulent-film type evaporator. Installed in October 1959, the unit is powered by a 15-hp motor and heated with 300-330°F, 120-psi, superheated steam passing through its jacket.

Sulfonate solutions are fed into the 2½-ft diam evaporator at rate of 10 gpm. Prod-

To page 74

ASK PHILADELPHIA

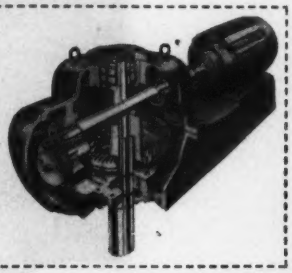
It takes mixing know-how to handle high rate gas/liquid contacting. You may need multi-speed motors to combine the right torque during gassing with overload protection at no gas flow. Philadelphia engineers can tell you for sure.

Or the mix may demand extra-generous freeboard for expansion during absorption. Ask us. Philadelphia engineers know mixing. And what isn't known about a brand-new process, our laboratory and research staff finds out . . . fast.

Good General Rule: In gas/liquid mixing, always supply enough torque for the liquid to disperse the gas and prevent binding or flooding of impellers, then add power as your process requires.

Best General Rule: Ask Philadelphia about mixers *and* mixing. Philadelphia Mixers do what they're sold to do. Philadelphia Mixers *mix*.

Here's the Secret of trouble-free mixing: gears precision-ground to master gear perfection. Tougher, quieter, more powerful—the best mixer drives made are made by Philadelphia.



Get Facts—and plenty of them—on mixer design, construction, and specification. Sections on *Fluid Mixing Practice* and *Process Mixing Technology* detail steps you can take to improve process efficiency. Read how to change gears in minutes for speeds from 20 to 280 RPM. Request 64-page Bulletin A-19 on your letterhead today.

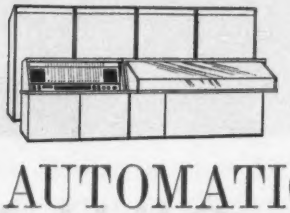
PHILADELPHIA MIXER

DIVISION OF PHILADELPHIA GEAR CORPORATION
King of Prussia (Suburban Philadelphia), Pennsylvania

AGMA MEMBER

ASK ANY ENGINEER / GEARS ARE THE HEART OF A MIXER

Check 4863 opposite last page.



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PCA-2

General Electric announces the new GE 412, a second generation solid-state, stored program computer designed solely for industrial and utility applications.

The GE 412 Digital Control Computer, new "big brother" in the General Electric family of process computers, has been designed with the total systems concept and flexibility of equipment organization in mind.

The resultant versatility and capability of the GE 412 makes it custom-adaptable to many particular applications in many varied industries—data-logging and monitoring, data-logging and control, economic dispatching, director (or dispatcher) in a multi-control system.

The new GE 412 is extremely fast—capable of 25,000 additions a second. It incorporates a core memory with drum memory backup, plus more than 100 basic commands, to provide wide programming flexibility. The Automatic Program Interrupt feature and Programmable Elapsed Time Counters permit the regular survey of critical points without wasting valuable computer time required for constant checking.

General Electric offers you the two basic elements for your automation program—the new GE 412 Digital Control Computer and the application experience necessary to get it operating efficiently in your plant.

General Electric engineers can detail the available full line of input/output equipment and computer services including SYSTEM DESIGN, PROGRAMMING and AIDS, TRAINING, INSTALLATION SERVICES, and MAINTENANCE SERVICES—offered by General Electric to get your automation program in operation quickly... for lower production costs, increased profits.

INVESTIGATE THE NEW GE 412—*contact your nearest General Electric Apparatus Sales Office or the Process Computer Section, Industry Control Department, P.O. Box 2918, Phoenix, Arizona.*
IN CANADA, *contact Canadian General Electric Apparatus Sales Department, Peterborough, Ontario.*
OUTSIDE THE U. S. AND CANADA, *contact International General Electric, 150 East 42nd Street, New York 17, New York.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

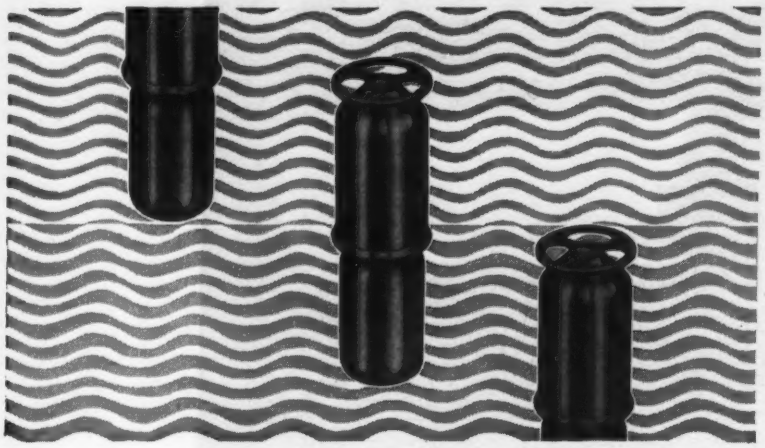
Check 4864 opposite last page.

Now you can mix or match ROTAMETER

capacities, pressure drops, prices

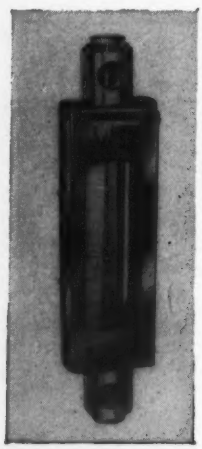
with the *new*

W&T VAREA-METER



Now you can have a useable kind of adaptability with Wallace & Tiernan's complete new line of Varea-meters. Deeply overlapping capacities and integrated tube-float combinations let you pinpoint capacity exactly. You get a truly job-proportioned rotameter.

Eight floats per tube size give a wide capacity selection. And Varea-meter capacities overlap 50% from meter size to meter size. For any given capacity you get a choice of two sizes. The larger gives you less pressure drop; the smaller costs less.



Size for size, Varea-meters give you more capacity than any other rotameter. A new float design and increased tube taper allow more throughput. You specify a smaller Varea-meter, which costs less.

New W&T Varea-meters come in ⅜" through 3" sizes with 5" and 10" scales. They measure up to 310 gpm water or 1300 scfm air over a range of at least 10 to 1. Transmitters, magnetic indicators, and the usual accessories are available. Varea-meters conform to ISA Recommended Practice.

For more information, write Dept. V-5.22

WALLACE & TIERNAN INC.

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

Check 4865 opposite last page.

From page 71

uct enters top of unit's "thermal" chamber where high-speed rotor blades force it against the heated, stainless-steel walls.

As liquid flows down the sides, it is kept in a thin-film condition by the revolving blades and reaches about 250°F, more than ample to drive off alcohol and water. Retention time is only a matter of seconds, minimizing danger of thermal degradation. Easy-to-control processing conditions assure desired end-product consistency.

Two-thirds of feed passes off as overhead condensate. This is sent to a sulfonate extractor and then recycled back into the evaporator. Concentrated end-product contains 3-5% water and has viscosity of about 4000 cp. It is drawn off bottom of unit.

Results: The turbulent-film evaporator processes approximately 14,400 gal sodium sulfonate solution per day — which is more than the combined output of the three batch stills that it replaced. It accomplishes this smoothly and continuously, eliminating the annoying power, heat and water fluctuations that previously existed.

The compact unit also conserves valuable refinery space by taking only ¼ the floor space of the former equipment. Maintenance costs have also been reduced. Savings in pump repairs alone are expected to pay for the evaporator in four or five years.

(Turba-Film Processor is product of the Rodney Hunt Machine Co., Orange, Mass.)

Check 4866 opposite last page.

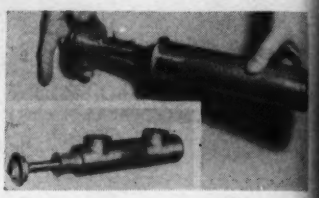
Filter-magnet combo removes tramp iron, other particles

Unit fits into pipeline, can withstand 350 psi

Uses: Removing iron contamination as well as non-magnetic particles from liquids or slurries.

Features: Combination ferrous trap and filter fits directly into line. Internals can be quickly removed for cleaning.

Description: Heart of trap is one-inch diam, stainless-steel, permanent tube-type magnet. Unit is housed in two-inch diam, perforated, bronze filter screen having 0.020 or



Ferrous trap can be quickly removed from filter for easy cleaning. Inset shows unit ready for installation in 2" pipeline

0.033-inch diam holes. Magnet and filter are enclosed in 350-psi bronze casting which has standard two-inch diam pipe inlet and outlet.

(Model L-2-F magnetic filter screen trap is product of Eriez Manufacturing Co., Magnet Drive, Erie, Pa.)

Check 4867 opposite last page.

NEW LITERATURE

Processing Equipment

Cyclone separators, heat exchangers and air filters are depicted in eight-page bulletin. Complete specifying data and prices are given for air filters. Bul 715 — R. P. Adams Company, Inc.

Check 4868 opposite last page.

Centrifugal separations is topic of four-page bulletin. Centrifuges, centrifugal screens and other units used in chemical and petrochemical processing industries are discussed. Bul 2800 — Dorr-Oliver Incorporated.

Check 4869 opposite last page.

Rebuilt chemical and processing machinery is listed in recent bulletin issued by the Irving Baroan Company, 249-51 Orient Avenue, Jersey City 5, New Jersey.

Eight jar mill styles for production, pilot plant and experimental runs are shown in 16-page catalog. Units range in size from a fractional of a pint to 60-gal. Cat 83 —Abbe Engineering Company.

Check 4870 opposite last page.

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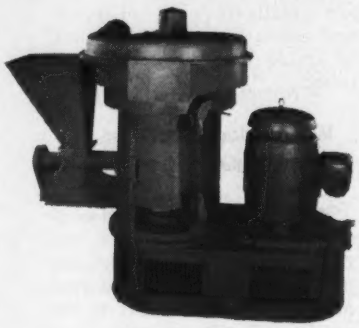
HURRICANE

PULVERIZER-CLASSIFIER



- **Pulverizes dry material to less than one micron**
- **Classifies precisely**
- **Provides ultimate uniformity**
- **Improves production control**

If you need the most precise method of reducing dry material to super fine size (even down to less than one micron!), this new Bauer air attrition mill can help you. The Hurricane Pulverizer-Classifier also accurately classifies such material as it pulverizes it.

In one typical application, involving hydroxy ethyl cellulose, yields up to 1500 lbs./hr. were reported with exact capacity depending on degree of polymerization desired. Sodium carboxy methyl cellulose also has been successfully reduced and classified in quantity.

If you are processing cellulosic derivatives or similar materials, send for information on the Bauer Hurricane Pulverizer-Classifier.

THE BAUER BROS. CO.

SPRINGFIELD, OHIO

Check 4871 opposite last page.

PROCESSING EQUIPMENT

Role of knife cutters in cotton flocking operations at Vertipile, Inc. is told in four-page technical reprint. Article discusses all phases of processing from receipt of white cotton clips to final screening. Bul KC-1 — The Young Machinery Co., Inc.

Check 4872 opposite last page.

Air filter that inflates when in operation and deflates when shut down, is discussed in eight-page brochure. Unit combines compactness with high efficiency. Bul 228 — American Air Filter Co.

Check 4873 opposite last page.

Where to use pug mills is outlined in illustrated, four-page brochure. Both single- and double-shaft units for continuous kneading, blending and feeding are reviewed. "Pug mills" — Lancaster Mixer and Autobrik Machine Division, Posey Iron Works, Inc.

Check 4874 opposite last page.

Knife cutter for granulating sheets of polyethylene and polypropylene is described in two-page specification sheet. Design and operating details are included. Spec Sheet 227 — Sprout, Waldron & Company, Inc.

Check 4875 opposite last page.

Flowsheets and drawings highlight 12-page bulletin that tells where jet-type vacuum apparatus is used in pulp and paper processes. "Application File for Pulp and Paper Industry" — Schutte and Koerting Company.

Check 4876 opposite last page.

"Center-Slung" centrifugals for liquid-solids separation are covered in 20-page catalog. Alignment chart for graphic computation of centrifugal force is included. Cat TC-16-17 — Tolhurst Centrifugals Division of American Machine and Metals, Inc.

Check 4877 opposite last page.

How heat-sensitive pharmaceutical slurries are spray dried at Eli Lilly is revealed in reprint of technical article. Key equipment is 10-ft diam cylindrical spray dryer. Reprint EL — Bowen Engineering Inc.

Check 4878 opposite last page.

Heat exchangers featuring removable bundles with floating clamp-ring design are topic of two-page technical bulletin. Units are fabricated from standard components combined with custom-built assemblies. Applications and engineering specifications are given. Bul 451 — American-Standard Industrial Division, American Radiator & Standard Corporation.

Check 4879 opposite last page.

let

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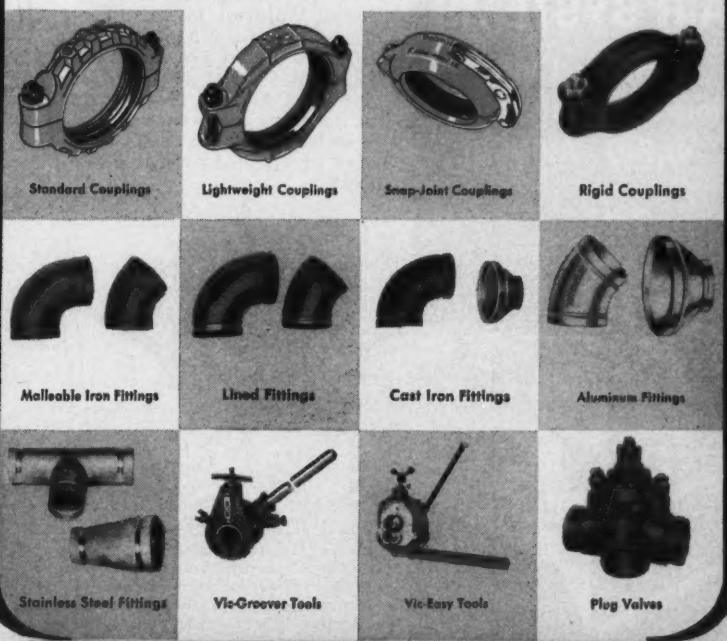

For complete information on any Victaulic product, write:

VICTAULIC COMPANY OF AMERICA

P.O. Box 509, Elizabeth, N. J.

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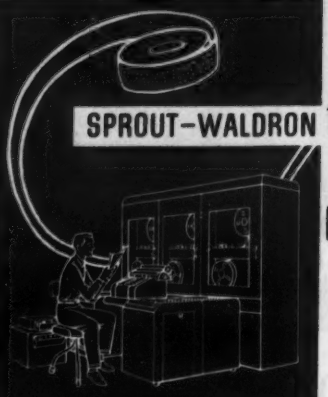


SPROUT-WALDRON PUTS DATA PROCESSING TO WORK TO SAVE YOU MONEY ON

PNEUMATIC CONVEYING SYSTEMS

75% to 80% of all pneumatic conveying needs are now standardized systems

The modern miracle of data processing has made it possible to analyze and tabulate Sprout-Waldron's long experience in air conveying systems to show that *75% to 80% of today's requirements can be handled by one of four standardized units!* Capacity data from years of specialized engineering and hundreds of successful pneumatic installations is now readily available.

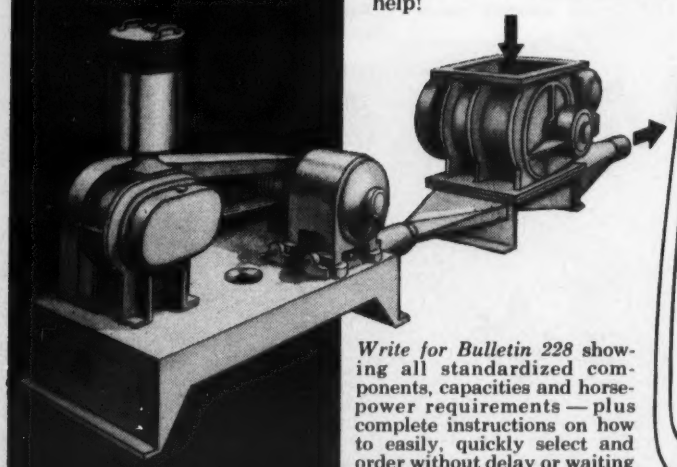
Data processing has enabled Sprout-Waldron to manufacture standard component parts in quantity and provide stock shipments — *with the savings passed on to you!* Now, most air handling requirements can be ordered without costly surveys or special engineering help!

4

STANDARDIZED EASY-TO-ORDER

PACKAGED AIR SYSTEMS

stocked for immediate shipment at BIG SAVINGS



Write for Bulletin 228 showing all standardized components, capacities and horsepower requirements — plus complete instructions on how to easily, quickly select and order without delay or waiting for outside assistance.

626

SPROUT, WALDRON & CO., INC.

MUNCY, PENNSYLVANIA

SINCE 1866

Size Reduction • Size Classification • Mixing & Blending • Bulk Materials Handling • Pelleting

Check 4881 opposite last page.

Table-top Computers

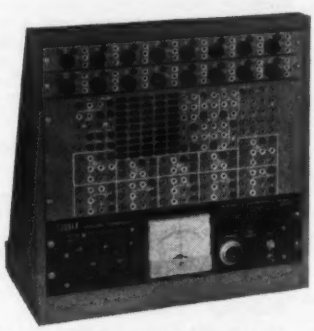
From page 26

have such involved mathematical descriptions that solution by hand is impractical.

What Kind of Men?

Through the leadership and encouragement of Monsanto's Research and Engineering Division in St. Louis, a number of (Springfield) Plastics Division personnel have taken graduate work in systems engineering. Use of analog and digital computers are subjects included in these studies.

One group was sent for a year's intensive training in systems engineering in a company-sponsored course given at St. Louis University. One group was enrolled in part-time graduate studies in systems engineering given by the graduate training branch of Renssalaer Polytechnic Institute, conveniently located between Springfield and Hartford.



Model 3500 portable analog computer, one of several combinations assembled from line of major components. It's made by Donner Scientific Company, Concord, Calif.

These men were selected from chemical, electrical, and mechanical engineers in the engineering and research departments. Since completing their training, members of these groups have largely been assigned to problems requiring use of their new specialty. The number of such projects is growing as profitable application of systems engineering techniques is being integrated into the normal design and process R&D functions.

The two consoles were delivered about a year ago and were introduced to research and engineering personnel through seminars. Purpose was to explain the concepts and capability of the equipment.

In the hands of systems-engineering-trained personnel, the computers have brought no problems in use. The units are relatively easy to patch and manipulate, are extremely stable and generally foolproof.

Mathematical Formulation of Problem Key to Unit's Use

Mathematical formulation of the problem is, however, the real challenge in attaining practical use of any computer, and this applies equally to the small analog computers.

With regard to the problem areas normally familiar to the systems-engineering-trained personnel, the formulation of the mathematical models and their computer solution has not been a stumbling block.

Problems in other areas which might well be solved using analog techniques depend, however, on the realization on the part of those most familiar with these problems that analog simulation is a tool which can often produce not only quick solutions, but added insight into complex relationships which usually exist in most processing situations. This awareness must evolve with time, and Monsanto is optimistic that the small analog computers will find increasing use. ■

NEXT MONTH

How good a job are the U.S. engineering schools doing in training men to run our chemical plants? What's coming up in the future in engineering education? These and other engineering-education questions will be considered in a special report in the August CHEMICAL PROCESSING.

Jersey Standard Story . . . *From page 25*

chemicals resources, is the capital resource that Jersey has available for deployment for new chemicals-producing facilities. The current attractiveness of chemical investments is related by Jersey's board of directors to their appraisal of hard facts of anticipated return. "Jersey looks upon the chemical field as an area of promising investment opportunity and, as such, a diversification from normal fuel products operations," comments one Jersey executive.

Structure of Corporation As Related to Chemicals

As a corporation, Standard Oil (New Jersey) is in effect run by a six-man executive committee. A total of 15 full-time members make up the board. The board's prime interest is making and securing return on investments. Operating details are left to the 128 affiliates. However, the Jersey board exercises control by serving, in effect, as responsible management consultant, banker and executive personnel department for the affiliates. As such, the board sets policies, has the final say on capital proposals, and overseas the selection, training and evaluation of the performance of affiliates' officers and directors.

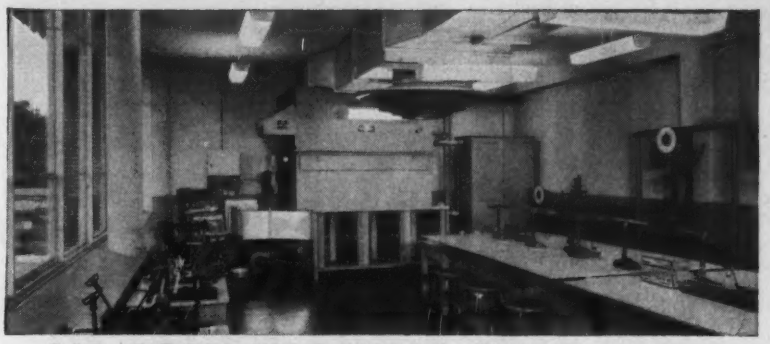
Formerly, board members represented specific affiliates for which they were responsible. Recently, in a further move towards decentralization, board representation became regional. Now directors represent interests of U.S., Canada, Latin America, Europe (including Mediterranean and West Africa), Middle East and Far East affiliates.

Committees function in every important area. The story is told that the detailed structure of Jersey was once introduced as a management problem (without company identification) to a group of

To next page

Here are key people within major affiliates who know the answers to petrochemical production problems

United States Dr. J. E. (Jack) Wood, III	President of Enjay Chemical Company, New York
Canada C. M. (Clay) Beamer	General manager of chemicals for Imperial Oil Limited, Toronto
United Kingdom T. C. G. (Tom) Thorpe	Sales manager for chemicals, London
France Lucien Kahn	Chemicals coordinator for Esso France, Paris
Holland H. L. (Herb) Minich	Chemicals coordinator for Esso Netherlands, Hague
Sweden W. C. (Warren) Wilson	General manager for petrochemicals, Stockholm
Australia E. T. (Ed) Marshall	General manager of Altona Petrochemical Company, Melbourne
Japan C. J. (Jerry) Bitzer	Chemicals coordinator for Stanvac, Tokyo
Colombia R. D. (Ray) McDougall	Chemicals coordinator for International Petroleum, Coral Gables, Florida
Aruba J. J. (John) Waybright	President of Antilles Chemicals Company, New York



AIR CONDITIONING THAT KEEPS ITS PROMISE OF PRECISION

NIAGARA Type "A" air conditioners assure that you actually realize all the benefits of precise atmospheric conditioning in your testing laboratory, your "clean room" or in your processing of hygroscopic materials.
This assurance; temperatures controlled to a fraction of a degree, relative humidity held to within 1%, results because this unit, exclusively, can provide saturated air in such compact space. Its extra capacity absorbs sudden peak loads. You hold your standard conditions continuously, without interruption. With its simple, inexpensive control you can vary your standard at will and reach the new condition quickly. Its range, using the Niagara "No-Frost" liquid below the freezing point of water, is through 140° F. Its reliability is proven. Service records show many machines still precise in operation after 20 years' service.

Write for Bulletin 58 and 122

NIAGARA BLOWER COMPANY
Dept. CP-7, 405 Lexington Ave., New York 17, N. Y.
District Engineers in Principal Cities

Check 4882 opposite last page.

SAMPLING BOMBS

for the oil and chemical industry. Alloy Products Corp. is one of America's leading custom manufacturers of stainless steel specialty products. Whether it's one or a hundred thousand, A-P-C manufactures to your exacting specifications on time.

Let A-P-C stainless steel engineers assist in your design problems. Cut costs substantially with A-P-C know-how. Full production facilities under one roof.

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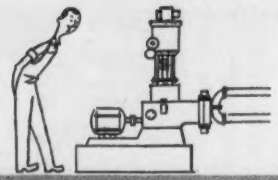
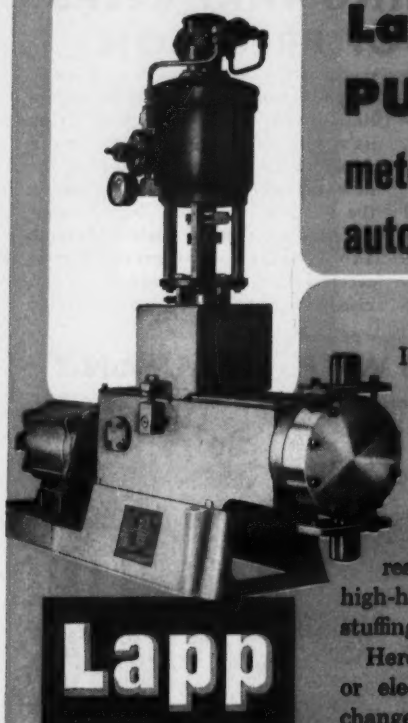




Lapp PULSAFEEDER meters liquid flow automatically!

It's strictly hands off with automated Pulsafeeders working in your process. These dependable pumps give you *automatically* controlled metering of liquids. They do it accurately and without resort to constant level controls, high-head tanks, measuring tanks or stuffing box pumps.

Here's how it works: A pneumatic or electronic instrument senses a change in the process condition. It then sends a signal to the Pulsafeeder, which interprets the signal and corrects its pumping rate *automatically*.

When liquids must be metered in proportion to changing process conditions—*and* in heavy production service—you can depend on the Lapp Pulsafeeder . . . the *trouble-free* automatic metering pump!

A NOTE on your letterhead will bring you Catalog 59 quickly. This new, complete, 28-page data book is chock-full of information on applications, specifications and descriptions of Pulsafeeders of a multitude of capacities and constructions. Write today . . . Lapp Insulator Co., Inc., Process Equipment Div., 1319 Poplar Street, LeRoy, New York.

Check 4884 opposite last page.

Jersey Standard Story . . . *From preceding page*

students at Harvard Business School. After two days of deliberation, they reached the conclusion that a corporation so organized simply could not function! Be that as it may, the Jersey system not only *does* work, but, according to some Jersey executives, serves to assure the bringing of many points of view into decision-making operations.

As part of the reorganization, a step was recently undertaken to remove the board further from matters of detail. This was the formation of the 12-man Board Advisory Committee on Investment (BAC). This group superseded the long-time Jersey Coordination Committee. It is through BAC that all major proposals for new investments, including those for chemicals flow from the affiliate originators. In function, BAC presents to the Jersey board a comprehensive analysis of each proposal on which the board can make its decision.

Affiliates in Each Country Individually Responsible

Organization-wise, Jersey's petrochemical business is carried out parallel to and in the same manner as its fuel-products business. The affiliate in each country is responsible for the petrochemical operations in that country, whether they be manufacturing and marketing, or marketing alone. The same central functional groups of Jersey that supply coordination and services to the affiliates on fuel products provide them also for petrochemicals.

Likewise, the same functional groups have the responsibility to BAC and to the Executive Committee of being certain that all investment projects submitted by the affiliates are attractive to Jersey's requirements and goals. Within Jersey's Refining Coordination Department (of BAC) there is a chemical group that works with the affiliates on the development of their petrochemical investment proposals. This group has an overall coordination responsibility in that, in the presentation of projects, it ties together the viewpoints and contributions of Marketing, Manufacturing, Supply, Research and Development.

Within Marketing Coordination (of BAC), there is a chemical group that works with the affiliates on marketing policy and sales practices. Assistance and advice are given to the affiliates in providing adequate, well-trained marketing organizations for chemical sales.

Esso International Corporation (EIC), previously unmentioned, has within Jersey the responsibility for movement of all products between affiliates, and for the sale of crude oil. Within this company, there is a chemical department which has the responsibility for the movement of all chemicals between affiliates.

To carry out this basic function better, EIC is also the centralized agency for overseas market research. It develops the potentiality for manufacturing affiliates to export and marketing affiliates to move imported products. EIC develops the transportation in handling of all such movements and supplies technical sales service and marketing assistance to the affiliates in moving such products.

Esso Research and Engineering Company is also a central group. It carries for Jersey the responsibility for research developments and engineering, has sections for chemicals in all these functions and provides technical sales service in the chemical field.

The various affiliates carry out their chemical operations with whatever organization patterns best fit their needs. Obviously, the larger the operation and, more specifically, when both manufacturing and marketing functions are involved, the more complex the organization that is required.

The major affiliates with respect to manufacturing and marketing are the Humble Company in the U.S.; Imperial in Canada; Esso Petroleum in the U. K.; Esso France in France; Svenska Esso in Sweden; Esso A. G. in Germany; International Petroleum

in Colombia; Antilles Chemical Company in Aruba; Altona Petrochemicals in Australia and Tanen Sekiyu Kagaku Company in Japan. In the latter two, participation is shared with others.

The largest affiliate with respect to size of chemical activities is, of course, the Humble Company, which is responsible for all of Jersey's chemical business in the U.S., except for Jersey's 50 percent ownership in the Ethyl Corporation. All aspects of the business, except manufacturing, are handled by the Enjay Company (which is a division of Humble). In fact, one might say that manufacturing is carried out for the Enjay Company at Humble's various petroleum refineries.

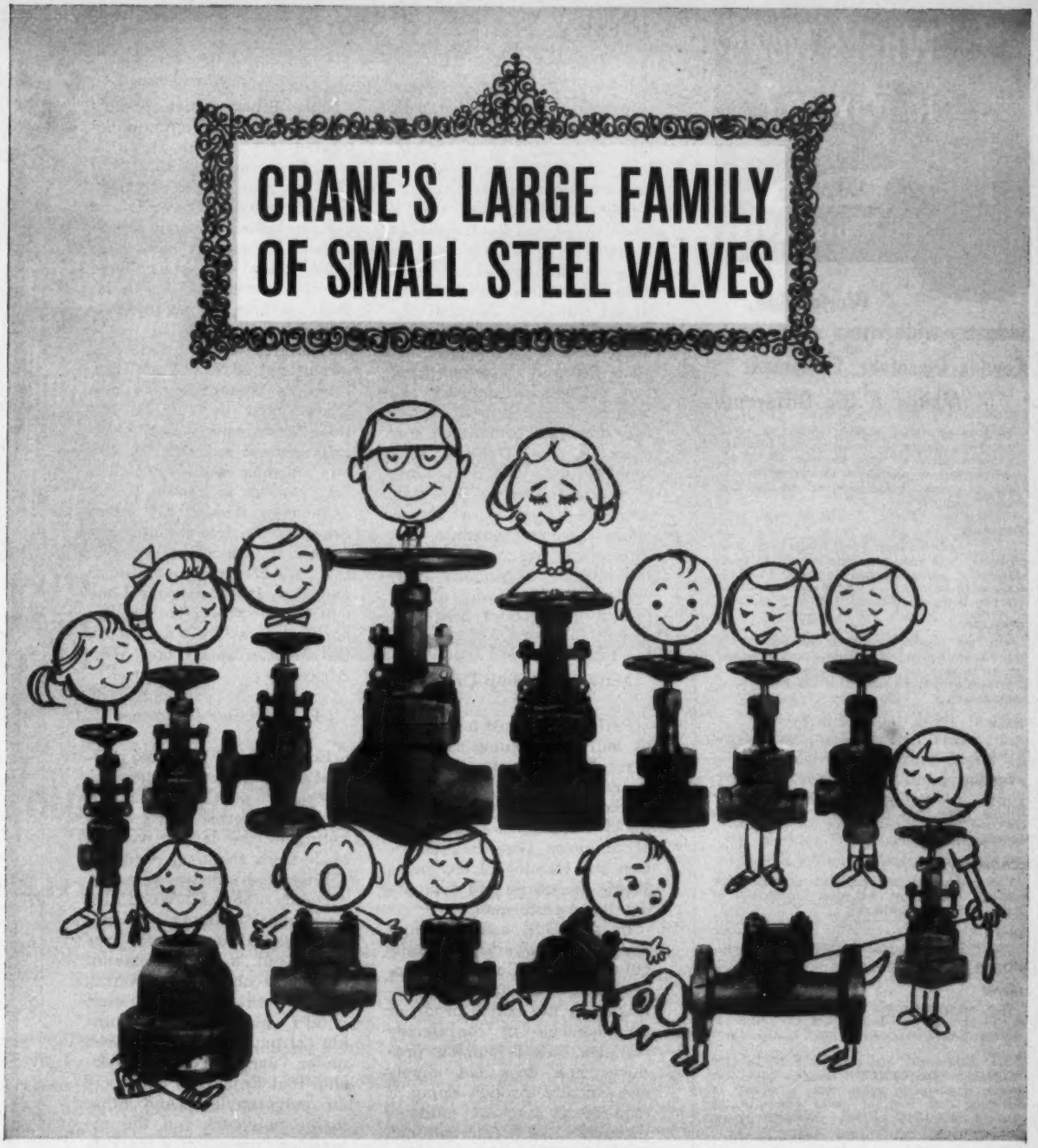
The overseas affiliate group is represented for investments by a man who had had a great deal to do with the expansion of Jersey in the overseas chemicals production. He is Bob Jackson, an extremely vigorous advocate of affiliate chemical activity. In his liaison and "selling" job (as he puts it) with more than 25 affiliates in his area of activity, he roams the world — but on a schedule that frequently keeps him away from his New York Office only a few days at a time.

His operation is "strictly personal," meeting informally with officers and manufacturing technologists of the companies involved. He regards one of his most important functions to be that of "making it easy for affiliates to talk with one another about chemical matters." The full implication of this remark may be better understood when it is considered that most affiliate people have petroleum backgrounds and may find modern chemicals a bit complex.

Jackson is a chemical engineer who spent the first 10 years of his professional career in refining, then switched in 1942 to the U.S. chemical operations and in 1955 to the parent company.

What does Jackson consider as the most difficult aspect of

To next page



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*Stellite is a registered trademark of Union Carbide Corp.

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Check 4885 opposite last page.

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". . . . extraordinary good results with these pigments . . . . using our micronized Red Oxide obtained a reading of 8-¾ on the P.C. (1-10) Scale in 10 minutes . . . . with our Leadchrome/Prussian Bluegreen obtained 8-¼ in 5 minutes."

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426

Check 4886 opposite last page.

Jersey Standard Story . . . *From preceding page*

his job? "Securing profitable return on overseas investment. There are many areas crying for investment to be made, but picking the good from the bad is a tough job."

One might suppose that a world-wide coordinator should be backed by a large staff to help load his "guns" for overseas trips. "This isn't the way to do the job," Jackson insists. "Instead, the important thing is to aid the affiliates to generate and develop their own projects, for only can the man on the spot truly recognize the needs of his area. For example, the U.S. is very sophisticated and demanding of product quality. Overseas, some areas place a higher value on lowest possible cost. This means we mustn't make the mistake of gauging their markets by our way of approaching product development."

Marketing Set-up Unusual

Perhaps the most interesting as well as intriguing aspect of Jersey's chemical operations is marketing. Lang Richards, as coordinator of marketing for chemicals, has a great deal of influence regarding selection and training of key marketing personnel and evaluating their performance.

In the U.S. and, for that matter the world, Humble Oil & Refining Company (Jersey U.S. manufacturing affiliate) is the major producer of chemicals in the Jersey complex. What Humble produces and does not supply domestically through Enjay, it exports to overseas affiliates through Esso International. And what the overseas affiliates can not economically get from Humble or other affiliates, they may themselves make with the aid of Refinery Coordination and market with the assistance of Esso International.

This assistance to marketing affiliates rendered by Esso International covers all aspects of marketing — analyses of market potential, direct sales assistance, sales force training, technical service, as well as assistance on product and raw materials supply.

Esso International obtains the materials from optimumly-located-and-stocked Jersey manufacturing facilities, and delivers them to the affiliates' customers by whatever means assures lowest over-all cost to Jersey. In such a role, Esso International serves as "buyer" and as such asks for "bids" from various Jersey affiliate manufacturing units.

Headquarters for Esso International is New York City. Here its chemicals operation is managed by affable Hal Rose, vice president and chemicals general manager. A former chemist still in his 40's, "H." (as he is known to his associates) divides his interests between his headquarters operation (which covers Jersey world-wide operations) and Esso International's London office which is regional headquarters for Europe, the Mediterranean and West Africa.

Enjay Is Star Performer

Enjay, for all practical purposes, is Jersey's "chemical company," because Enjay has built and services the marketing of the largest volume of Jersey's chemical products.

Enjay is headed by friendly, gracious John E. Wood, III, a chemical engineer who has come up through some refining but a major amount of chemicals manufacturing and marketing experience within what is now the Humble structure. It has been under "Jack" Wood's leadership that Enjay has embarked on polypropylene and other major polymers and the intensified "prescription marketing" that these require. He also works closely with the Enjay labs which are *ne plus ultra* in polymer-applications testing and formulation equipment.

In Wood, Jersey has a chemical executive who is progressive and alert to industry trends. Under his administration, one may expect a continuing series of developments — both product and marketing-wise — which should be commensurate with the best

To next page

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Check 4887 opposite last page.

offered by anyone in the chemical industry.

Jersey's Chemicals Future?

Hazardous as predictions may be, particularly when chemical company strategies are concerned, it may nevertheless be helpful to pass along the following observations:

There are many indications that Jersey may continue to proceed much along the same lines as in the past, emphasizing derivatives of petroleum. Such a path would carry Jersey through a continuing series of developments, sometimes bold, other times possibly spectacular. There is much evidence that Jersey is tending to move in the direction of more sophisticated chemical products.

Progress in the competitive world of applied chemistry may, however, be even more demanding in versatility and fundamental innovation where it is most likely to pay off on terms of other raw materials, non-refining types of processes. Will Jersey be sufficiently flexible to compete in this area? Some observers wonder if *any* oil company will have sufficient versatility and imagination at management levels.

Emphasis Seen Being Placed on Chemical Processing

Impressive evidence contrary to this point of view, however, is the emphasis Jersey is placing upon equipping and advancing scientists familiar with the most advanced concepts and techniques of chemical processing of the future. This is exemplified by the complex of laboratories and the building of other research and engineering facilities at Linden and Florham Park, N.J. ■

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

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7 Welded Nozzles — Spacing
8 Preheat - Postheat Welding, Low Chrome — Moly Pipe
9 Arc-Welding Dissimilar Ferritic Steels
10 Stress Relieving Practices
11 Affixing Permanent Symbols to Piping
12 Preheat - Postheat Welding, Medium Low Chrome — Moly Pipe
13 Classification, Shop Testing, Inspection, Cleaning

Check 4888 opposite last page.

Extensible-paper bags win e

With 50% of bags in use switched to stretchable paper, more changes are being explored

"School of hard knocks" starts for bag almost as soon as it leaves filling machine. First "knock" consists of several-inch drop from chute to conveyor

AN EXTENSIBLE PAPER, appropriately enough, is helping one firm to stretch the purchasing power of its packaging dollar.

A NEW SOLUTIONS FEATURE

In the 18 months since American Cyanamid Company first began experimenting with multiwall, extensible-paper bags, the company has steadily extended its usage until, at present, 50% of its bags are made of extensible paper. Products ranging from alum to pigments (see table) are being handled in the extensible-paper multiwalls. Other applications are being explored and it is expected that the company will convert entirely to this type of paper for bags.

Savings are estimated at $4 to $5 per thousand bags, a substantial figure when multiplied by the hundreds of thousands of bags used annually by the company.

This savings is derived from the fact that the same degree of product protection afforded by heavier standard kraft multiwalls is attained by extensible-paper multiwalls with fewer plies and plies of lower basis weight. (Basis weight is the weight of 500 24 x 36" sheets of a particular paper. For a given grade of paper, the lower the total basis weight, the lower the cost.)

A relative newcomer to the family of paper products, extensible paper is uncreped, regular kraft paper which is compacted and compressed in the production process, making it "stretchable" and enabling it to withstand greater impact than standard paper. The developer estimates that it can absorb up to five times as much punishment as regular kraft.

Cyanamid's primary reason for adopting extensible-paper multiwalls was the cost factor. Standard kraft multiwalls had been providing satisfactory service; although due to the number of plies and heavier weight, they were more difficult to handle and work with than the flexible, lighter ex-

Cyanamid's Savings through use of Extensible Paper Multiwall Bags

Product	Bag Capacity, lb	Extensible Paper Construction*	Former Regular Kraft Construction*	Savings in Basis Wt, lb
Alum	100	3/50	2/40, 2/50	30
Alum (lump)	100	1/70, 3/60	1/70, 4/60	60
Yellow Prussiate of Soda	100	1/50, 1/110AL, 1/50, 1/60	1/50, 1/90AL, 1/50, 2/60	40
Rubber Chemicals (DPG, etc.)		3/60	2/50, 1/60, 1/70	50
Melamine (Customers)	80	3/60	2/50, 2/60	40
Melamine (Intra-Plant)	80	First 3/60 Now 2/50, 1/60	2/50, 2/60	60
Melostrength® Paper Resin	75	1/50, 1/110AL, 1/60, 1/70WS	1/50, 1/90AL 1/50, 1/60, 1/70WS	30
Cymel® Resin	50	1/50, 1/10PE50,** 1/50, 1/60	1/50, 1/15PE40, 2/50, 1/60	40
Animal Feed Supplements	50	1/7PE40,***1/40 2/50	1/7PE40, 3/50, 1/50LSC	60
Pigments	50	2/50, 1/60	2/40, 1/50, 1/60	30
Oversilp Bags		2/50	1/40, 2/50	40

* Bag construction is indicated by listing basis weight of each ply in sequence starting from inside. Number before slash (/) indicates number of plies of basis weight identified by number following slash. ("AL" refers to asphalt-coated ply; "WS" indicates wet-strength paper; "LSC", low-stretch crepe.)

**Number "10" before "PE" indicates polyethylene film thickness—equivalent to 10 lb of film spread evenly over surface of paper area equivalent to 500 sheets of 24 x 36" paper.

***Indicates seven lb of polyethylene instead of 10, as explained above.

expanding role at Cyanamid

tensible-paper bags.

In making the changeover, extensive tests were conducted for each product and recognition was obtained from the Uniform Freight Classification organization before the company standardized on the lighter weight multiwalls.

For example, in the case of aluminum sulfate ("alum" on table), trial shipments were carefully checked and were found to be in excellent condition upon arrival.

As can be seen from the table, bags for each product were considered individually. All, however, do utilize extensible paper.

For yellow prussiate of soda, the 100-lb bag adopted has four plies — two 50-lb, a 60-lb and 110-lb basis weight plies, the latter asphalt-coated as a moisture barrier.

Of special interest, also, is the bag for Melostrength® paper resin. The outer ply is of wet-strength extensible paper.

Polyethylene-laminated extensible-paper ply is used in the Cymel® (a melamine

Ground aluminum sulfate is here being bagged in extensible-paper multiwall at Cyanamid's Warner plant, Linden, N. J.

DISTRIBUTE LIQUIDS EVENLY THROUGHOUT BATCHES OF DRY MATERIALS

Mixing limited quantities of liquids with dry materials sometimes presents a problem.

Certain areas in a batch may be saturated while other parts remain dry, resulting in an uneven distribution of the liquids.

Still other materials tend to agglomerate.

Paul O. Abbé Rota-Cone Blenders prevent both these difficulties. They are so constructed that liquids are distributed evenly throughout each batch of dry material.

The spray nozzle of the Rota-Cone is rigidly positioned over the batch. As the blender revolves, a fine mist is sprayed over the ever-changing surface of the dry material. Each particle is exposed to the mist of only a fraction of a second at a time. This ensures an even distribution of the liquid. Wet areas in the batch and on the Blender walls are avoided. Lumps and particle aggregation are kept to a minimum.

Where the material does tend to agglomerate, the use of an agitating element quickly disperses soft lumps. Even fibrous masses like asbestos and cocoanut are separated without seriously affecting the length of the fibers, and are then uniformly coated with a dry or liquid additive.

In conjunction with the atomized spray, a wider range of materials can be handled. Speed of liquid addition is faster, and particle agglomeration is avoided.

For complete details of Paul O. Abbé Rota-Cone Blenders write today for a copy of our new Catalog C-1.

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Get high conveying capacity—when and where you want it—without the expense of duplicating equipment. Fuller Portable Airveyor® Transfer Units provide flexible, lower-cost handling to and from cars, trucks, storage bins and silos of every type. Hook-ups are quicker, too, because these Fuller units use pipes, hoses and nozzles of minimum size to deliver maximum capacity. Units combine clean-cut appearance with compactness and stamina never before available in portable equipment. Made in three sizes, the units are rated to handle pellets from 4 to 20 tons per hour for conveying distance of 30 feet on the suction side and 100 feet on the pressure side.

For full details, write for Bulletin A-23.

See Chemical Engineering Catalog for further details and specifications.

4083
A296

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resin) bag. While more expensive than asphalt, it provides more moisture protection and reduces such problems as stiffness in winter, "bleeding" if bag contents are packaged hot, gumming of sewing needles and possible contamination.

Two bags are used for shipping melamine, the lighter version for intra-plant shipments where practices can be controlled.

A "bonus" savings was chalked up in packaging animal feed supplements due to the skid-resistant qualities inherent to extensible paper. Previously, the company had used an outer ply of "low stretch" crepe to give the package skid resistance and speed stacking and handling.

To page 86

Additional Data Available

Clupak extensible paper, used in American Cyanamid's bags, was invented by Sanford L. Cluett, known as originator of shrink-resistant process described by the familiar Sanforized trademark. West Virginia Pulp and Paper developed the paper commercially, and with Cluett, Peabody & Co., Inc. jointly formed Clupak, Inc., 530 Fifth Ave., New York 36, N.Y., to license the process.

More detailed information may be obtained from the following U.S. licensees:

Albermarle Paper Manufacturing Co., Richmond 17, Va.

Calcasieu Paper Company, 808 West Bay St., Jacksonville 3, Fla.

Continental Can Company, Inc., 530 Fifth Ave., New York 36, N.Y.

Crown Zellerbach Corporation, 1 Bush St., San Francisco 19, Calif.

Hudson Pulp and Paper Corporation, 477 Madison Ave., New York 22, N.Y.

International Paper Company, 220 E. 42nd St., New York, N. Y.

St. Regis Paper Company, 150 E. 42nd St., New York 17, N.Y.

Union Bag-Camp Paper Corporation, 233 Broadway, New York 7, N.Y.

West Virginia Pulp and Paper, 230 Park Ave., New York 17, N.Y.

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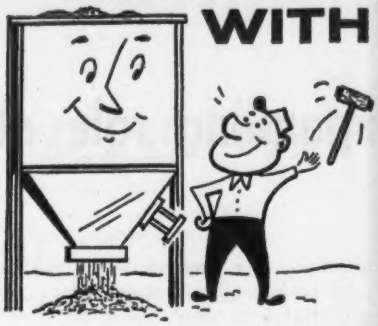

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THAT'S INTERESTING

Leaden silence

Sound curtain that provides about the same acoustical isolation as a cinderblock wall has been produced by Mohasco Industries.

Mohasco simply incorporated lead wire in a drapery fabric. Material looks like rich, rough decorator drapery fabric.

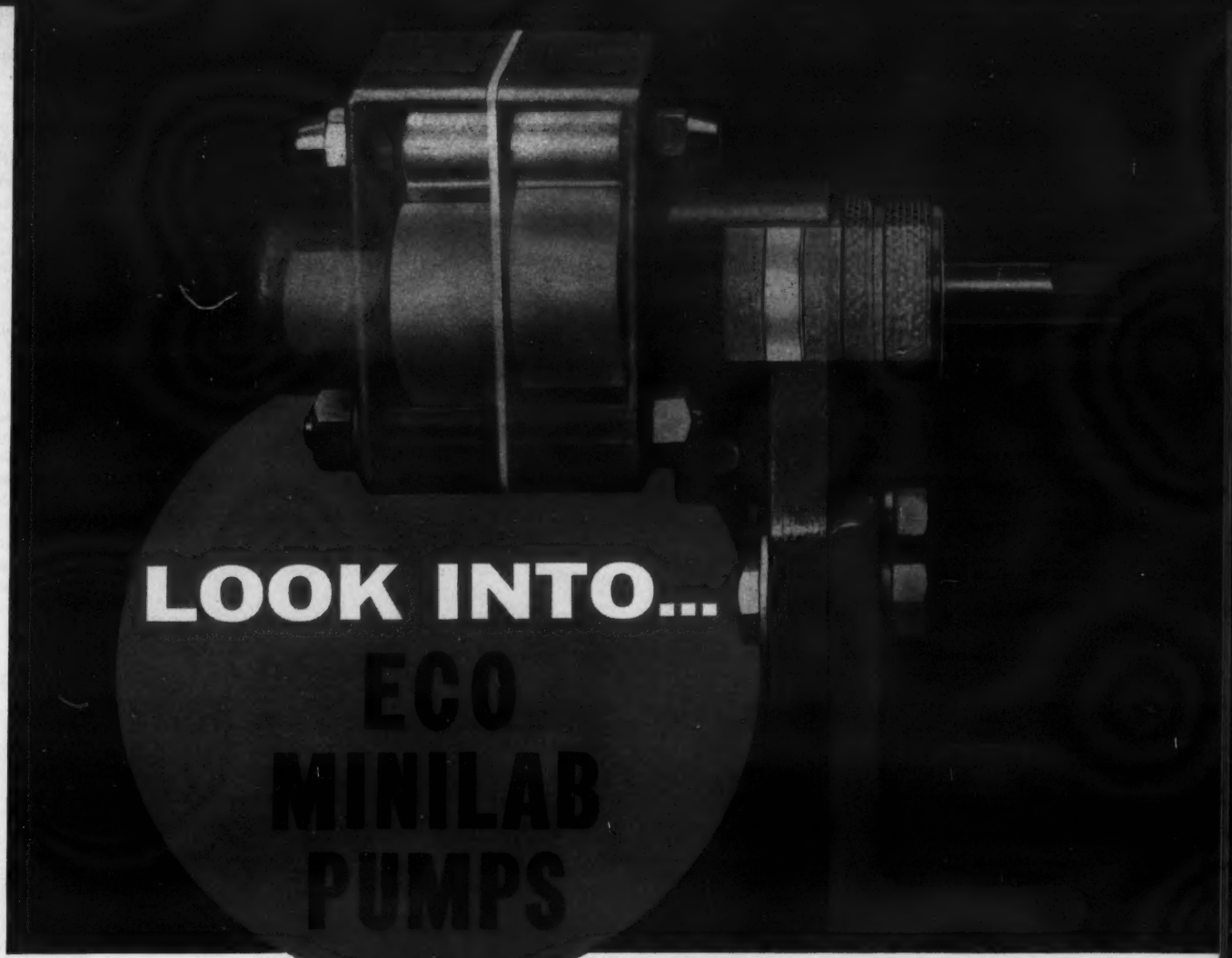
Stainless steel boom

Stainless steel sales, which shot up 118% between 1947 and 1957, will rise another 87% by 1967, according to a series of market research studies completed by The International Nickel Company, Inc.

Neoprene to last 50 yr

As result of tests launched more than year before Pearl Harbor by DuPont's Elastomers Chemicals laboratory, neoprene is deemed serviceable for 50 yr or longer.

For more information on product at right, specify 4892 see information request blank opposite last page.



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Want a rugged little, general purpose, self-priming rotary pump for carboy services, general laboratory operations, pilot plant work? Choose the Eco Minilab.

Offered in Hastelloy* C with twin impellers and bearings in either Teflon† or carbon, these pumps are suitable for pumping a broad range of clear, non-abrasive media including the most severe corrosives. They operate in either direction and are designed for direct, in-line connection to air or electric motors.

No lubrication or contamination is involved as media pumped is its own lubricant and coolant.

Pressures up to 150 psi. Viscosities to 1500 SSU. Suction pressures from 22″ Hg (in water-like fluids) to 26″ Hg (in viscous media). Temperatures to 300° F. Ports ⅜″ IPS. Flows from .05 to 2.2 gpm.

Write for new catalog page HCT-161.

Write for Literature on any or all of the Eco stock pumps shown below for handling corrosive or hazardous processing fluids.

*Union Carbide Trademark. †du Pont Trademark.

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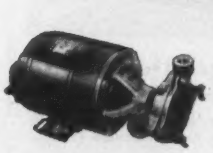
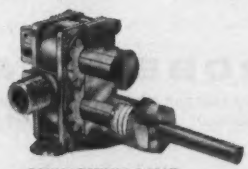


CENTRI-CHEM LINE

ALL-CHEM LINE



GEARCHEM LINE

MINILAB LINE

ECO ENGINEERING COMPANY · 12 New York Avenue · NEWARK 1, N.J.

From page 84

With carload lots of bagged commodities, oversize bags are supplied to be slipped over bags broken in transit or in unloading.

An indication of the durability of the extensible multiwalls is provided by the fact that overslip bags included in a carload generally number less than 1% of the total in the shipment.

Cyanamid reports that breakage has not increased since extensible-paper bags were put into service.

The company has drawn up standards for each multiwall for each product, and bags are purchased throughout the organization to meet these standards. ■

Tumbler transforms bin into process vessel

Bulk-handling bin becomes a blender when used in conjunction with recently-introduced device for holding and rotating bin by diagonal corners. Close blend can be accomplished in about five min.

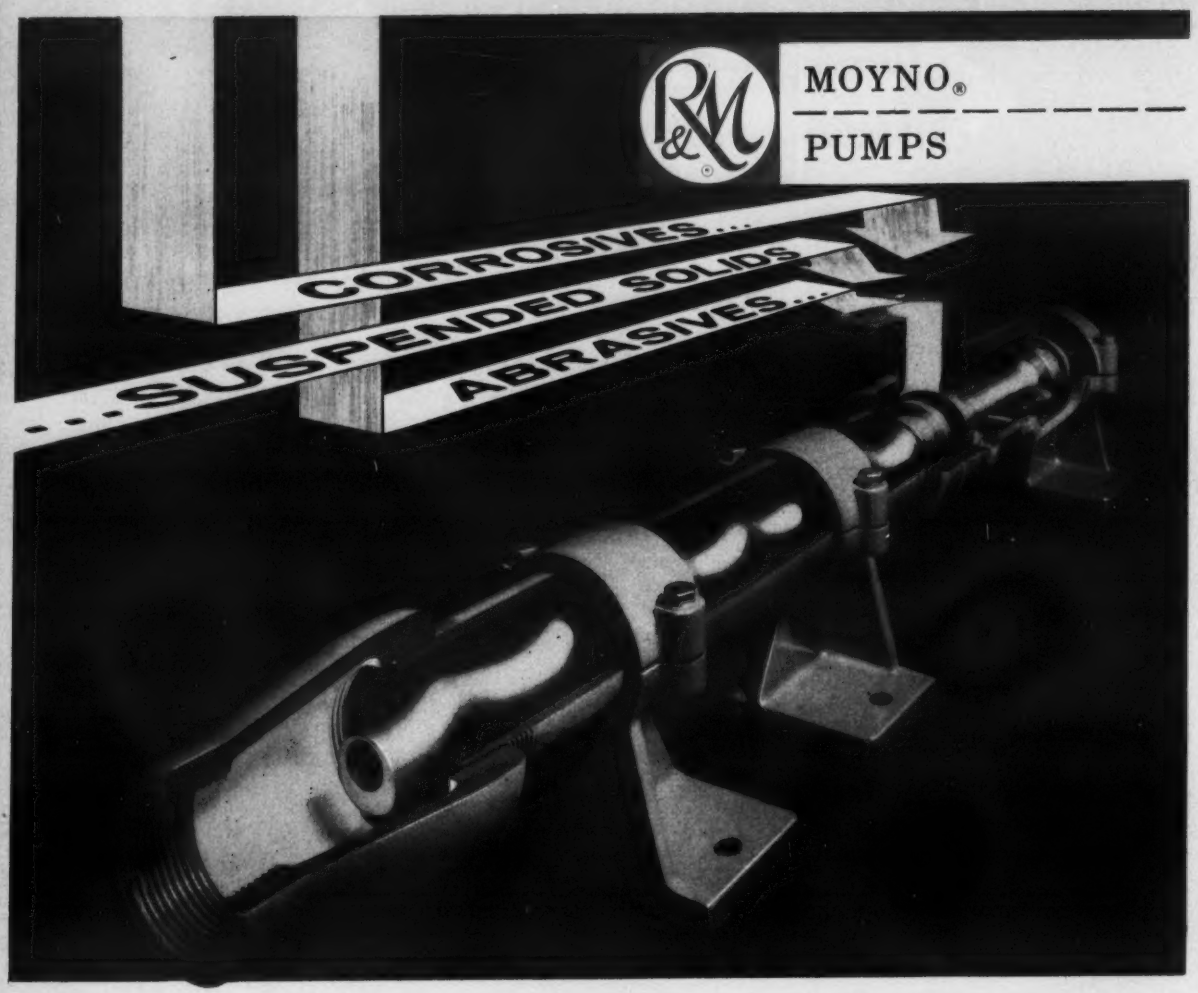
Originally introduced as storage, shipping and discharge container, bin can be placed on automatic scale, fed with different materials from screw-type tilting device or conveying system and contents then tumbled before being taken to use point. This eliminates need for separate weigh hoppers, blenders and conveyors.

Tumbling device was developed for plastics industry for blending virgin material with regrind and color concentrate.

(Tote tumbler is being introduced by Tote Systems, Inc., division of Hoover Ball & Bearing Company, Beatrice, Neb.)

Check 4894 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.



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Subsidiary companies at: Memphis, Tenn., Pico Rivera, Calif., Brantford, Ontario.

Check 4893 opposite last page.

▸ A NEW SOLUTIONS ARTICLE

Bulk shipments handled with hoppers in plant geared for bags

Problem: Georgia Marble Company's Calcium Products Division at Tate, Ga., bags 41 different kinds of crushed marble products and ships them to customers in this form.

Since plant was geared to this form of handling, occasional orders for bulk shipments presented difficulties.

Solution: Self-dumping hoppers were purchased for handling bulk orders. Fork truck positions hopper beneath discharge chute of storage bin or places it next to valve-type bag packer. Each hopper holds approximately 2400 lb of material. Capacity is 1 cu yd. When hopper is filled, truck carries it to boxcar or truck awaiting bulk shipment.

Self-dumping hopper being filled

Tripping release handle on rear of hopper permits it to rock forward and empty. It automatically returns to upright position and locks.

Results: Use of hoppers have streamlined handling of bulk shipments for Calcium Products Division. When not needed for bulk handling, hoppers are used instead of wheelbarrows for hauling plant waste and cleaning up spillage.

(Self-dumping hoppers are product of Roura Iron Works, Inc., 1401 Woodland Ave., Detroit 11, Mich.)

Check 4895 opposite last page.

NEW

RAYMOND MPS MULTIWALL GIVES

COMPLETE

MOISTURE PROTECTION

For the first time, the protection of polyethylene and the strength of rugged multiwall have been successfully combined to give **complete** moisture protection in the packaging and shipping of hygroscopic and other "difficult-to-package" products ...plus, elimination of many corrosion and contamination problems. The Raymond flexible MPS Multiwall sack can cut your costs up to 50% or more by replacing costlier, space-consuming fibre drums and other rigid-type containers. This process utilizes a **seamless** polyethylene tube integrated with the multiwall... then sewn and heat-sealed above the sewline to give **perfect sealing**...keeps product quality constant from packing through final use.

The Raymond MPS (Multiwall Perfect Seal) shipping sack has already met the critical requirements of storing and shipping such diverse products as milk replacers, refractory cements, plastic resins, anhydrous sodium bisulphite, and others. Potential applications are seen for **any product** in **any field** that requires protection from or retention of moisture. Let Raymond's experienced packaging engineers work with you to put your "difficult-to-package" products in economical, rugged multiwall... you may well realize substantial savings in storage, freight costs, and ease of handling, as well as drastic reductions in original package costs.

Mail this coupon or write for full details on this important packaging development.

Raymond BAG CORPORATION
A DIVISION OF ALBEMARLE PAPER MFG. CO.
MIDDLETOWN, OHIO

Raymond Bag Corporation • Middletown, Ohio

Tell me more about the new Raymond MPS Bag.

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

New York, Chicago, Kansas City, Baltimore, Louisville, Atlanta

Check 4896 opposite last page.

ALUMINUM GRATING ...WITH "LOCKED-IN" CROSS BARS!

Gary Galok*

SUPER ALUMINUM GRATING

Extra Strong! Exclusive swaging and forming process prevents cross bars from turning, twisting, coming loose or falling out . . . provides greater strength and rigidity than gratings using obsolete methods of joining bars. Non-rusting and corrosion-resistant . . . ideal where chemical conditions prevail.

Lighter Weight! High strength to weight ratio. Minimum deflection . . . easier to install.

Better Looking! Can be used for decorative purposes, sun shades, grilles, etc. Can be anodized in sunfast colors to blend with surroundings.

Available with serrated or plain bars—in all sizes to meet practically every requirement.

Write for Bulletin A759

Dept. G-17, E. Seventh Ave., Gary, Indiana

*Patent Pending

ROCKWELL-STANDARD CORPORATION

Grating Division, Gary, Indiana

Check 4897 opposite last page.

Pallet load of 12 wirebound containers is being carried by lift truck (left) to unloading dock where they are filled (right) from tank truck

Distributor ships more for less . . .

Plastic drums in overpacks lighten shipping and cost loads

Problem: Glass carboys in heavy wooden cases were used by F. H. Ross & Co., southern chemical distributor, for shipping chemicals to customers within 220-mi radius of the Mobile, Ala., branch.

A NEW SOLUTIONS FEATURE

Muriatic acid, sulfuric acid, acetic and aqua ammonia, received by tank truck or tank car from manufacturers, were transferred directly into palletized carboys. These were either stored or shipped directly to Ross customers—chemical specialties manufacturers, paint manufacturers, metal processors and textile finishers.

Fragility Is a Factor

The 13-gal carboys, encased in wooden boxes, weighed 70 lb each. Due to their size and weight only six could be placed on a pallet. This complicated storage and limited the number that could be shipped per truck or carload. Their weight and bulk made them difficult to handle. Use of glass, even with maximum protection, posed possibility of breakage and release of hazardous chemicals.

Solution: After investigating alternative packages, 15-gal cylindrical, molded polyethylene drums in octagonal wirebound overpacks were adopted, where feasible, for this service.

Overpacks consist of wooden slats, reinforced with galvanized steel binding wires and staples. Top and bottom heads, securely locked into wood drum body, are supported by heavy wooden cleats.

The overpack is engineered so that protruding neck of the polyethylene drum is just below level of the end cleats, permitting filled containers to be high-stacked.

Filling, handling and storage procedures for wirebound containers are similar to those used with carboys.

Results: In use for almost two years, wirebound containers have proved satisfactory for shipment by common carrier, mostly trucks.

Benefits Are Enumerated

A checklist of the benefits accruing looks like this:

- ✔ Container costs trimmed over 60%
- ✔ Storage requirements reduced "appreciably." Palletized wirebound drums are stacked four-high at Mobile.
- ✔ Shipping container tare weight down 77%—from 70 to 15.5 lb/container.
- ✔ Pallet capacity upped—instead of six 13-gal carboy cases, each pallet now

holds 12 wirebound drums, a doubling of the number of containers. The gallonage is more than doubled, increasing from 78 to 180.

Customers enjoy reduced freight charges and the same handling and storage benefits realized by Ross.

(Polyethylene drums are made by Delaware Barrel & Drum Company, Inc., Wilmington 99, Del.)

Check 4898 opposite last page.

(Wirebound overpacks are manufactured by Wirebound Box Division, St. Regis Paper Co., 150 E. 42nd St., New York 17, N.Y.)

Check 4899 opposite last page.

Shelters can be erected with slotted angles

Uses: Erecting pallet racks, heavy-duty shelving, work benches, jigs, and even building structures.

Features: Slotted angles are 100% adjustable, inexpensive

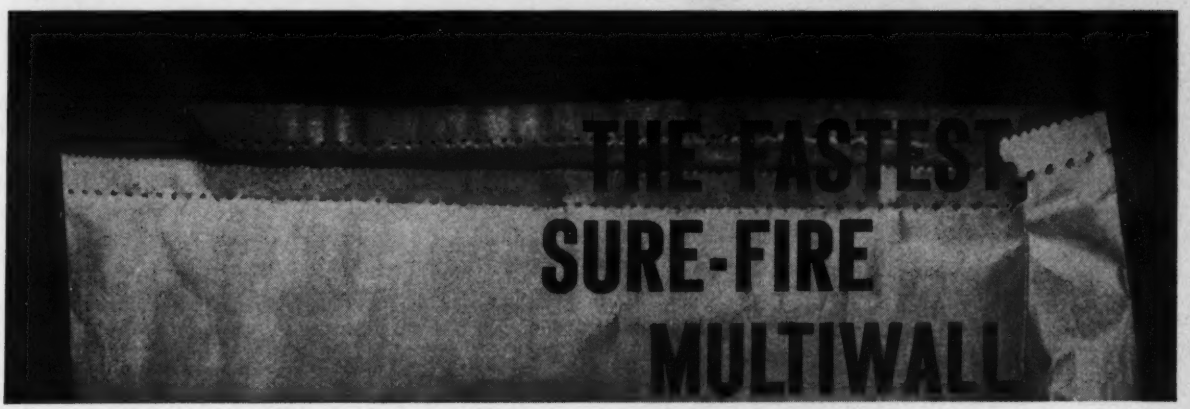
Open docks can be roofed using slotted angles

to install without special tools or skilled labor.

Description: Available in six sizes, ranging from 1¼ to 1¼ x 14 gage to 3 x 1-⅞ x 12 gage, 10 or 12′ long. All sizes completely interchangeable. Accessories such as shelves, cutters, plastic feet and casters are available.

(Angle-strut is being introduced by Tube-Strut Corp., 4560 Sperry St., Los Angeles 39, Calif.)

Check 4900 opposite last page.



*Trade Mark

OPENING

How fast can you swing your arm?

That's how fast you can open a Bemis Multiwall with Bemi-Strip closure. Just grab the red tab and pull. The bag opens quickly, easily.

A tight seal . . . yet a fast, economical opening that leaves the bag intact.

No fumbling for thread ends. No cutting. No stuck closure seams. And no paper shreds or thread clippings, so . . . assured cleanliness.

Note: Production machinery to manufacture the Bemi-Strip feature is being installed in Bemis plants as rapidly as possible, but the feature is not yet available on the West Coast or in parts of eastern United States. The feature will be available nationally in just a few months. Ask your Bemis man for complete information.

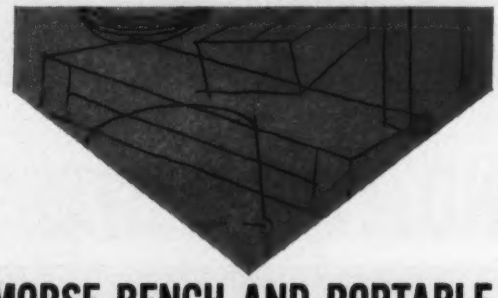
BEMIS BRO. BAG CO.

where packaging ideas are born

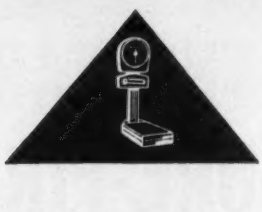
General Offices—408 Pine St., Box 92, St. Louis 2 • Sales Offices in Principal Cities

Check 4901 opposite last page.

NOW! "CHECK WEIGHING" CAN BE MORE ACCURATE...MORE ECONOMICAL!



FAIRBANKS-MORSE BENCH AND PORTABLE "FLOAXIAL" DIAL SCALES



Now you can "check weigh" anything for industry (from a one-pound can to a one-ton barrel), in, out, or all about more accurately—more economically! Modern Fairbanks-Morse Dial Scales provide proved accuracy that works for you, year after year. And—because our Scales are built to last longer, you realize long-life economy . . . freedom from repairs or early replacements!

PROVED ACCURACY! Our "Floaxial" Dial Scales are famous for proved accuracy! Exclusive "Floaxial" mechanism eliminates knife edge or pin point pivots, features hard bronze fully adjustable cams, full-floating pendulums. Shielded ball bearings and corrosion resistant working parts assure free movement.

EASIER TO USE! Easy to use and move. Dial head swivels full 360° to any position. Rubber-tired wheels lock and/or Dial mechanism locks. Cast aluminum construction cuts weight.

EASY TO READ! Red knife blade indicator picks out just one scale graduation at a time. Special indicator tip eliminates parallax. Black numerals on brushed aluminum dial. No paint to peel, crack, or craze.

LONG-LIFE SERVICE! Rugged lever systems take shocks of dropping loads and stay accurate! Pivots are hardened steel with precision ground knife edges.

CAPACITIES: BENCH AND PORTABLE DIAL SCALES: Available in capacities from 50-3200 lbs.

3 PLATFORM SIZES: 18" x 20", 21" x 29", 30" x 30" available for both Bench and Portable Dial Scales.

For further information, write: C. G. Gehringer; Scale Division; Fairbanks, Morse & Co., 100 Electra Lane, East Station; Yonkers, New York.

FAIRBANKS MORSE
A MAJOR INDUSTRIAL COMPONENT OF
FAIRBANKS WHITNEY

Check 4902 opposite last page.

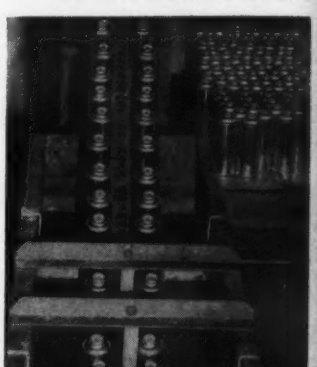
▶ A NEW SOLUTIONS ARTICLE

Magnetic rails eliminate handling operation in aerosol-can testing

Problem: Filled aerosol cans were tested at Cincinnati Aerosol Corp., Cincinnati, Ohio, by placing them in wire baskets and then dipping can-laden basket into 150°F hot water test bath. Tell-tale trail of bubbles, caused by pressure built up by heat, would expose defective cans.

This meant handling cans twice, once when they were placed in the basket and then as they were removed following test.

Solution: A non-magnetic stainless steel belt was installed to carry cans from filler, through test tank, and onto next step in operation.



Aerosol cans, shown moving along conveyor line into hot leak-test tank, are held tightly to belt by permanent magnetic rails

Double lines of cans are steadied on belt by magnetic field from permanent magnetic rails mounted directly beneath belt.

Results: Steel cans, moving in double line at speeds up to 20 fpm, cling tightly to belt, yet may be easily removed for inspection.

Handling operation, required when cans were put in baskets before being dipped, has been eliminated.

(Magna-Rails are manufactured by Eriez Manufacturing Co., Erie 6, Pa.)

Check 4903 opposite last page.

NEW LITERATURE
Material Handling and Packaging

Trolley conveyors and what they can do to reduce manufacturing and handling costs are subject of 58-page book. Publication includes complete information for design of system and other pertinent data. Book 2730 — Link-Belt Company.

Check 4904 opposite last page.

Gravimetric dry feeder, capable of handling chemicals of densities between 10- and 100-lb/cu ft with maximum capacity of 8000 lb/hr at accuracy of ±1%, is described in Bul 260 — Infilco Inc.

Check 4905 opposite last page.

Storage and handling of company's acrylic monomers is subject of 16-page Acrylic Handling Bul — Plastics Department, The Dow Chemical Company.

Check 4906 opposite last page.

Conveyors for handling bulk and packages are covered by text, diagrams and photos of 56-page Cat 70 — Conveyor Systems Incorporated.

Check 4907 opposite last page.

Pumps, designed for handling dry, powderlike materials in totally-enclosed system of pipe, are introduced in eight-page bulletin. Pump makes closed systems for dry powders both practical and efficient for lines up to 200' in length. Bul 110 — Moyno Pump division, Robbins & Myers, Incorporated.

Check 4908 opposite last page.

Lift trucks, ranging from 2000- to 10,000-lb capacities, are described and illustrated in 16-page Cat BU-660 — Allis-Chalmers Manufacturing Company.

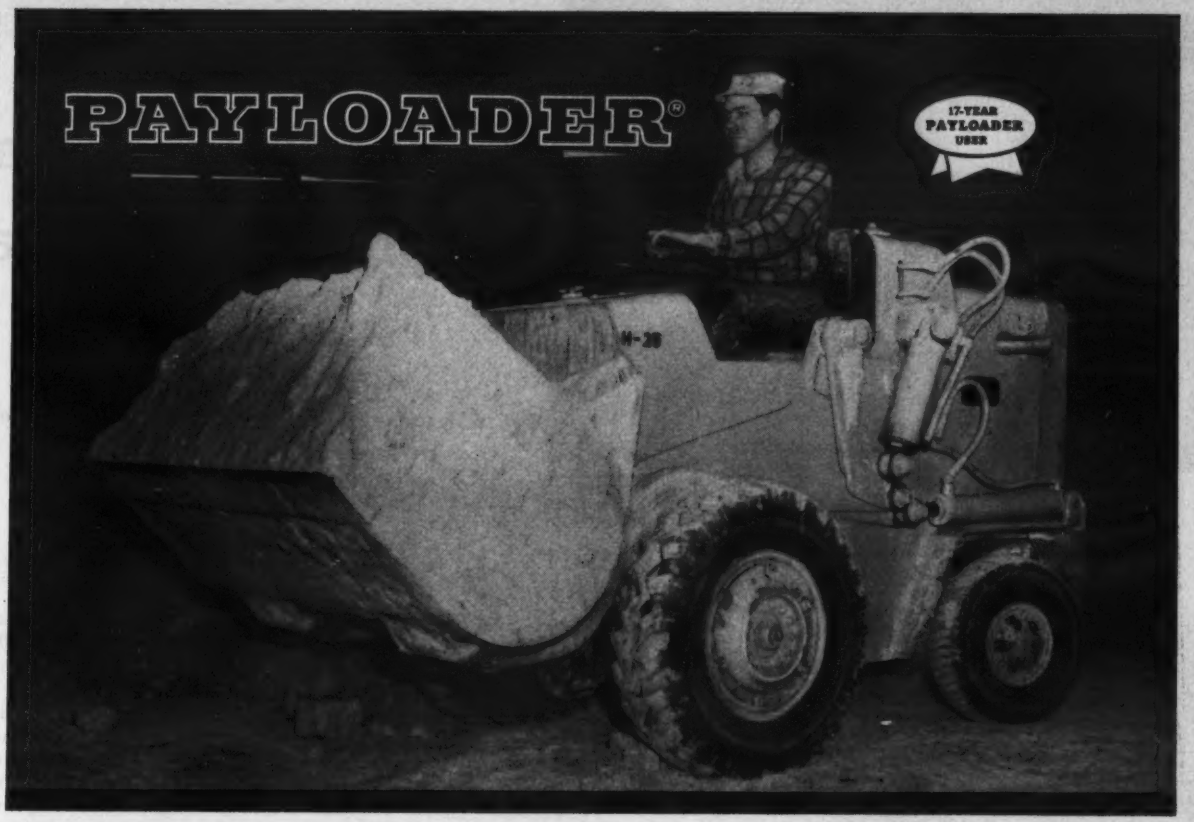
Check 4909 opposite last page.

Casers, both automatic and semi-automatic, are presented with pictures and specifications for all basic equipment — set-up machines, loaders and sealers — in eight-page folder. Bul CMD602-W — Stokes & Smith Plant, FMC Packaging Machinery Division, Food Machinery and Chemical Corporation.

Check 4910 opposite last page.

Selecting linings for steel containers is simplified with 49-page booklet which presents test results and includes details on available linings. Test Chart Manual — Linings Evaluation Department, Bradley & Vrooman Company.

Check 4911 opposite last page.



H-25 handles 30% more tonnage

At the Home Guano Company in Dothan, Alabama, a fleet of six PAYLOADER tractor-shovels play a major role in the production of sulphuric acid and commercial fertilizers. Five Model HA's (2,000-lb. capacity) and a new 2,500-lb. operating capacity Model H-25 are used throughout the plant in all operations . . . unloading railroad cars, mixing, bagging, moving machinery, handling sulphur and general maintenance.

"We have been using PAYLOADER tractor-shovels since 1944 with satisfactory performance," says Superintendent R. C. Geiger. "In fact, we find that the new Model H-25 is giving us about 30% additional load delivery over the older HA's. It also gives us better all-around operating efficiency; it digs hard materials with less wheel slippage and is less tiring on the operator."

The Improved Performance Record turned in by the H-25 is no surprise. This loader is designed and built for time and money-saving production. It combines a 2,500-lb. capacity with complete power-shift transmission, power steering, a short, 6-ft. turning radius and power-transfer differential to move big tonnage efficiently, even in close quarters.

The H-25 Also Has Built-in Protection through many special features that guard against dust, dirt and moisture damage . . . dual air cleaner, cartridge-type oil filters, sealed and self-adjusting hydraulic service brakes, enclosed parking brake and special oil and grease seals on all vital pivot points.

Why Not Consider the possibility of reducing your handling equipment "fleet" and boosting the hourly production rate in your plant with an efficient H-25 PAYLOADER? A Hough Distributor nearby will be glad to demonstrate its cost-cutting performance. Contact him or return the coupon for more information.

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THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

HOUGH, PAYLOADER, PAYMOVER, PAYLOGGER, PAYLOMATIC and PAY are registered trademark names of The Frank G. Hough Co.

THE FRANK G. HOUGH CO., 744 Sunnyside Ave., Libertyville, Ill. 7-A-3

Send "Industrial Material Handling from A to Z"

NAME
TITLE
COMPANY
STREET
CITY STATE

Check 4912 opposite last page.

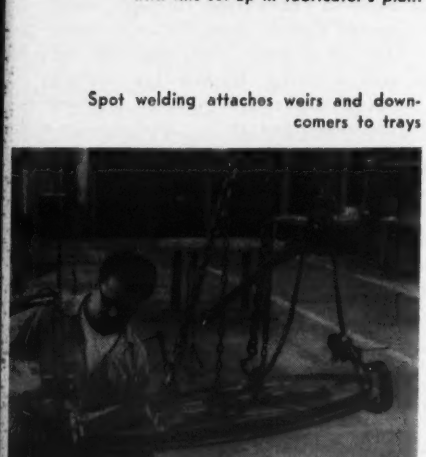
Column woes vanish with titanium trays

Rugged metal easily resists corrosive environment, out-performs 11 other materials in tests

Lagging machine is used to roll collar on titanium sieve tray

Finished trays are checked and leveled with this set-up in fabricator's plant

Spot welding attaches weirs and downcomers to trays



A NEW SOLUTIONS FEATURE

Problem: Severe corrosive attack limited life of sieve-type trays in 72-ft-tall, crude organic chemical reactor column at a large plant of Union Carbide Chemicals Company, Division of Union Carbide Corporation. The worst situation existed in the region about 25 ft from bottom of unit, where type-316 stainless-steel trays lasted about six months.

Copper trays were tried without success. Although showing a lower corrosion rate, they had to be replaced after only four months due to erosion of tray holes and consequent loss of efficiency.

The column consisted of nine, type-316 stainless-steel sections. Each measured eight feet high and 42 inches across. Wall thickness was 0.250 inch. Individual sections had five trays, or a total of 45 trays in the overall unit.

Solution: A series of corrosion tests was conducted in which various alloys and metals were used. Specimens were exposed at the 15th plate in the midst of the column's critical area. Maximum corrosion rates, calculated in inches per year, follows:

304 stainless steel	0.120
316 stainless steel	0.088
317 stainless steel	0.040
430 stainless steel	0.111
Alloy 20	0.145
Hastelloy alloy B	0.022
Hastelloy alloy C	0.060
Hastelloy alloy F	0.022
Copper	0.025
Monel	0.070
Nionel	0.133
Titanium	Nil

Based on the results of the tests, the company decided to install two experimental trays made of titanium. The locations selected were No. 13 and 18 trays. The 0.062-inch-thick titanium units were put in service August 1959.

Frequent inspections showed that the new trays had no difficulty resisting the corrosive environment. Consequently, 25 additional titanium sieve trays were ordered and installed in June 1960. The two veteran trays were again examined at that time, were found to be uncorroded, and were promptly returned to service.

The trays were fabricated from 16-gage, commercially-pure titanium sheet. The manufacturer, using conventional forming equipment and techniques, experienced no difficulty in producing the trays. Fabrication procedure follows:

Perforated sheets were reduced from squares to circles by a cutting machine. Tray collars were then rolled on a lagging machine. After crimping the trays on a power brake, downcomer openings were cut by an electric hand saw. In the final step, weirs and down-comers were joined to trays by spot-welding.

Results: Switch to titanium has completely solved the tray corrosion problem in the amines reactor column. Costly downtime, excessive maintenance and poor production efficiency due to troublesome trays have been eliminated.

The proved performance of the titanium units almost immediately prompted a further step in corrosion control. Column sections two, three and four, which were gradually deteriorating because of corrosion, are now being replaced by titanium-lined, carbon-steel sections. In the fabrication of these units, 16-gage commercially-pure titanium sheet was also used.

A rolling operation shaped the sheet to fit the inside diameter of the outer carbon-steel shell. The lining was then machine-welded at the seam. Three of these liner sections were joined by welding and slipped inside each of the eight-foot-long, 48-inch-diameter steel shells.

Approximately 2000 lb of titanium was used to make trays, liners and fittings.

(Further information about titanium may be obtained from Union Carbide Metals Company, Division of Union Carbide Corp., N.Y. 17, N.Y.)

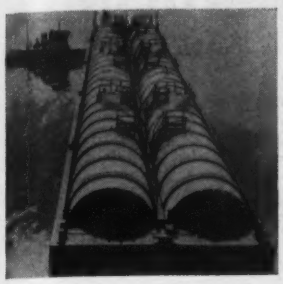
Check 4913 opposite last page.

(Titanium sieve trays were fabricated by Vulcan Manufacturing Co., Cincinnati, O.)

Check 4914 opposite last page.

(Titanium-lined column sections were manufactured by The Pfaudler Company, a division of Pfaudler Permutit Inc., Rochester 4, N. Y.)

Check 4915 opposite last page.



Nickel-lined cargo holds

. . . resist corrosion and minimize danger of contaminating chemicals shipped in Union Carbide Corporation's new barge. By plating a ductile, adherent nickel coating 0.008" thick on drawing-quality steel, company was able to take advantage of structural strength of steel and corrosion resistance of nickel at significant economic savings.

(Lectro-clad nickel-plated steel used in barge was furnished by Bart Manufacturing Corporation, 125 Manchester Place, Newark, N. J.)

Check 4916 opposite last page.

Teflon-lined hose resists corrosives at 300°F

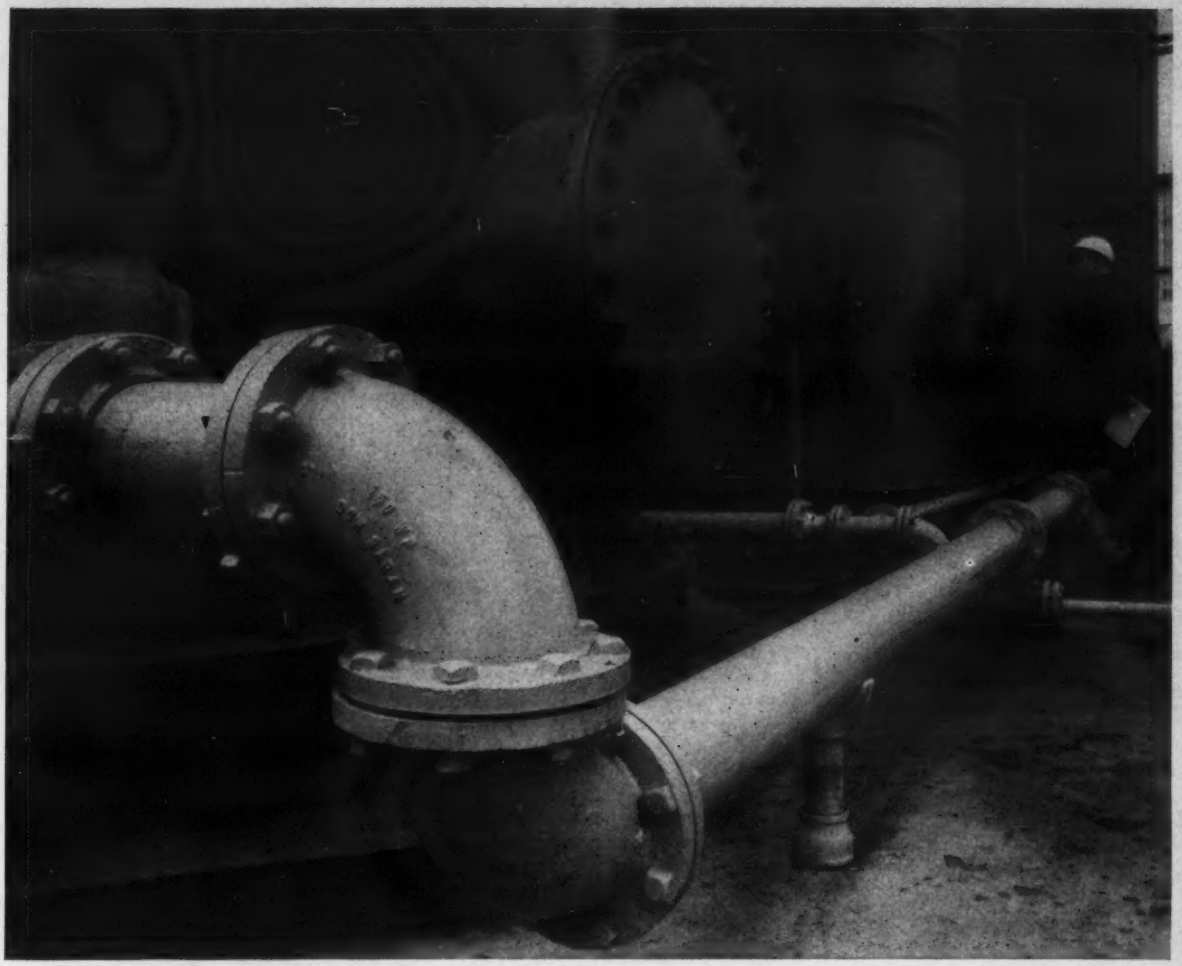
Chemical transfer hose is available that is made of Neoprene lined with Teflon and has type-316, stainless-steel, male fittings. Light in weight and rugged, the hose can be used with acids and industrial chemicals at temperatures up to 300°F.

The Teflon lining assures rapid flow of fluid with minimum buildup of solids. Hose is easily cleaned by flushing. It can be installed without need of special tools. Fittings insure leak-proof seal at pressures to 75 psi. Neoprene portion of hose is reinforced with spiraled wire.

Hose is available in diameters from 1 to 3" and in lengths up to 10 ft.

(Fluoroflex-TRC chemical transfer hose is product of Resistoflex Corporation, Roseland, New Jersey.)

Check 4917 opposite last page.



Wyandotte Chemicals Corporation, Wyandotte, Michigan

SARAN LINED PIPE—"Superior under highly corrosive conditions... our own crews install it."

For the past seven years, Saran Lined Pipe has carried highly corrosive acids and processing chemicals for Wyandotte Chemicals Corporation, Wyandotte, Michigan. In one area, Saran Lined Pipe has carried monochloroacetic acid continuously since 1955 *without a single lining failure!*

"Saran Lined Pipe has given us superior performance under highly corrosive conditions," says Mr. Charles H. Culnane, Plant Superintendent. "It's the most practical transporting medium available for use under severe conditions and temperatures which reach as high as 180° F.

"Saran Lined Pipe has high structural strength, which means maximum safety for personnel working in the area. Other, more fragile pipe could break if accidentally hit, but not Saran Lined Pipe. And because it needs a minimum of support, labor and material costs to install it are less than with other kinds of pipe."

"All Saran Lined Pipe is installed by our own crews, using regular pipe fitters' tools and techniques," explains Mr. William Tucker, Maintenance Manager. "It can be easily installed by any experienced pipe man. As we need them, we cut short sections to length from our ten-foot stock sections of different size pipe. Thus we can install Saran Lined Pipe when required, not at a supplier's convenience!"

For chemical piping systems that will provide years of trouble-free service—consider Saran Lined Pipe. Saran Lined Pipe, fittings, valves, and pumps are available for systems operating from vacuum to 300 psi, from below zero to 200° F. They can be cut, fitted and modified easily in the field without special equipment. For more information, write Saran Lined Pipe Company, 2415 Burdette Avenue, Ferndale, Michigan, Dept. 1572LG7.

THE DOW CHEMICAL COMPANY DOW Midland, Michigan

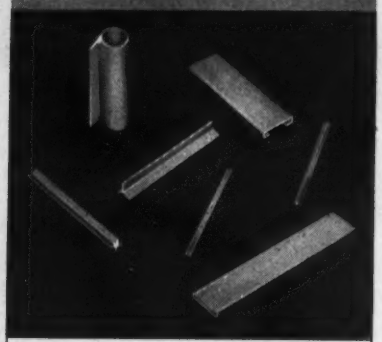
Check 4918 opposite last page.

NO MOLDS—NO WASTE—
NO MACHINING

PF EXTRUDED TEFLON* SHAPES

Reduce Cost of Components

for chemical applications



Some of the many shapes extruded by Pennsylvania Fluorocarbon for the chemical and mechanical industries include: fluid separators, feeding tubes for small parts, channels and seals.

These shapes offer:

- the widest service temperature range of any plastic (-450°F. to +500°F.)
- complete chemical inertness
- lowest coefficient of friction of any solid material
- very low permeability

Extreme Dimensional Accuracy Assured On Any Appropriate Design

PF extruded shapes made from Teflon allow design engineers to incorporate the chemical inertness and low coefficient of friction of Teflon into their products, economically. PF extrudes intricate Teflon shapes to extremely close tolerances, cuts them to lengths, post forms to requirements and performs any auxiliary machining steps. Molds are eliminated, there is no waste of Teflon and, frequently, no additional finishing operations are necessary. Result? Teflon components of extreme accuracy at lower cost.

Write, wire or call for a quotation on your particular Teflon component requirements, regardless of the intricacy of the shape. Shapes ranging from 2500 feet per pound to 6 feet per pound can be extruded.

PENNSYLVANIA FLUOROCARBON CO., INC.

1115 N. 38th Street, Phila. 4, Pa.
EVergreen 6-0603 TWX: PH 252

*DuPont registered trademark

Check 4919 opposite last page.

CORROSION CONTROL

▶ A NEW SOLUTIONS ARTICLE

Penton-coated agitators battle HCl, abrasion in drug plant

Problem: Corrosive reaction between product and stainless steel agitators presented constant contamination threat at Strasenburgh Laboratories, Rochester, New York. The equipment was used in mixing operations that involved 3½% of 37% HCl in water at room temperature.

In addition to this highly corrosive environment, the agitators were exposed to abrasive attack from the product, which has sand-like consistency.

Solution: Agitators coated with Hercules Penton (chlorinated polyether) were installed. The material is prepared as a water suspension and is sprayed on to the metal base and then fused at 400-500°F.

Coating is resistant to corrosive attack by most acids and alkalis and many solvents to a temperature of 210°F. Finished surface is hard, glossy, nonporous and smooth.

Result: The coated agitators have withstood the corrosive environment for over a year and show no signs of wear. Two units are in use. Some 30,000 lb of product have been processed with each during this period.

The agitators are easily cleaned. There have been no signs of any product being absorbed by the coating. An insignificant degree of abrasion wear has been observed on leading edge of agitator blade, but this was anticipated due to consistency of product being processed.

(Pfaudlon-301 coated agitators were manufactured by The Pfaudler Company, Division of Pfaudler Permutit Inc., 1000 West Ave., Rochester, N.Y.)

Check 4920 opposite last page.

For more information on developments in the section, check the Reader Service Slip.

THINKING ABOUT
BULK HANDLING?

THIS IS WHERE EXPERIENCE COUNTS

Everyone knows Bulk Handling will cut costs—save money . . .

The important point is:

FLUIDIZER
CAN DO IT *BETTER*... BECAUSE FLUIDIZER HAS THE *EXPERIENCE*

Fluidizer pioneered in this area and knows what will work and how to pinpoint capabilities and limitations. You don't pay the penalty for costly guesswork. Experienced Fluidizer engineers create unique and imaginative approaches to specific customer requirements. Successful performance proved by repeat purchases. Call us for the *facts*.

Proven record for conveying: Sugar (including powdered) Starch, Flour, Dried Milk, Chemicals, Plastics, Clays, etc.

Fluidizer®

made by FLUIDIZER DIVISION
OF DAFFIN CORPORATION
Hopkins, Minnesota • Phone West 8-7651

AIR CONVEYING SYSTEMS . . . *"most advanced in modern Air Handling"*.

Check 4921 opposite last page.

need more information . . .

Note there is a key number at the end of editorial articles or advertisements. To request more information check the proper number on the convenient form opposite the last page. Send the form to us . . . we do the rest. Information comes direct to you. No obligation, of course.

THAT'S INTERESTING

Cleaner conditioner

Double-action dry cleaning solvent conditioner is being introduced by Pennsalt Chemicals Corp., with an eye on burgeoning coin-operated dry cleaning market.

Dubbed "Pennsorb," conditioner combines adsorptive properties of activated carbon and soil and fatty acid removal ability of sweetening agents.

These jobs formerly required two separate products.

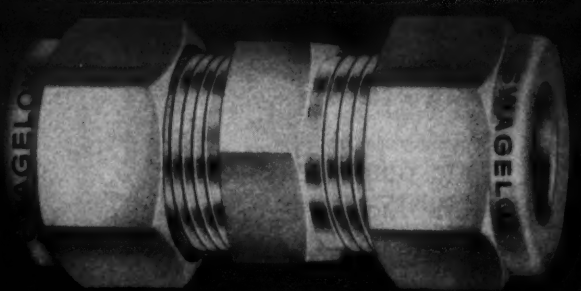
Taxes and plant sites

High taxes won't automatically frighten away a company considering a new plant location, a survey by Fantus Company reveals.

Industry is inclinded to examine what a community has to offer—and what taxes buy—before deciding on site, Fantus officials say.

For more information on product at right, specify 4922 see information request blank opposite last page.

WHY WAS THIS TUBE FITTING MADE FROM PLATINUM?



This Swagelok tube fitting was machined from Platinum because that is what our customer needed for his nuclear reactor experiments. This is just one of many outstanding examples of Swagelok customer service. The scientist who needed this fitting knew that Swagelok tube fitting reliability would meet the exacting requirements of leak tightness for nuclear work. He also knew that full cooperation in delivering Swagelok in any machineable metal is routine.

Swagelok, the tube fitting of total dependability, can be provided in any machineable metal or plastic to solve your most demanding problem.

Swagelok® TUBE FITTINGS SOLVE YOUR PROBLEMS

CRAWFORD FITTING COMPANY • 884 EAST 140th St. • CLEVELAND 10, OHIO
CRAWFORD FITTINGS (CANADA), LTD. • NIAGARA FALLS, ONTARIO, CANADA

If you have a tough corrosion problem and need wire cloth or wire cloth parts, here's a source of supply that knows the answers. We are proud of the quality of our cloth...accurate mesh count, close tolerance wire diameter, precision weaving...plus the know-how necessary to specify the proper alloy for your service conditions.

NEWARK for ACCURACY

Write or call us today if you have a problem calling for anti-corrosive wire cloth or wire cloth parts. Send for Bulletin F-C.

Newark Wire Cloth COMPANY

351 Verona Avenue • Newark 4, New Jersey
Teletype: NK607 • Tel.: HUmboldt 3-7700
Representatives in all principal industrial areas

Check 4923 opposite last page.

CORROSION CONTROL

Designed to eliminate guesswork and costly errors, AMCA standard tells . . .

How to specify and ready fan surfaces for protective coatings

C. JACK TRICKLER, Chief Engineer
The New York Blower Company
La Porte, Indiana

AS A GUIDE to engineers who specify the preparation of fans and blowers for the application of protective coatings, The Air Moving and Conditioning Association (AMCA) has come up with a four-page standard of recommended practice. The document fills the need for a reliable method of specifying and, indirectly, pricing the work that has to be performed on such devices to ready them for corrosion-resistant coatings.

Until now there has been an unfortunate lack of uniformity among specifiers, coating applicators and fan manufacturers. Sometimes this has led to expensive and wasteful situations, where units with no surface treatment received costly, elaborate coatings while those with expensive preparation ended up with low-quality coatings.

Considers Surface Preparation, Design and Construction

The preparation of fans for protective coatings involves two major considerations. The first is the treatment applied to the metal surface to remove grease or scale that would prevent the coating from adhering and to assure that the surface is receptive to adhesion. The second involves type of fan or blower design and construction best suited for the coating involved.

For example, it might be better to continuously weld the fan instead of using intermittent welding. In another case, it may be wise to change the design of a component so that a threaded fastener normally in the air stream is placed out of the air stream.

Bearings are also difficult to protect. On severe corrosion applications only single-inlet fans are recommended with drive arangements that have bearings located outside the air stream.

The AMCA standard emphasizes that the quality of the finished coating is greatly dependent upon the quality or degree of preparation of the fan or blower before coating. It points out that it is difficult to get good coverage of a paint or coating over a sharp metal edge such as results from normal shearing operations.

While it may be economically unreasonable to spend excess time removing sharp edges in preparation for a relatively inexpensive paint to withstand normal atmospheric exposure, it is just as foolish to omit a step that would increase the durability of a high-priced rubber coating.

Any coating will perform better when attached to a clean surface without edges or corners, reports the standard. Some coatings are absolutely worthless unless applied only to the best prepared surface.

Watch Guarantees

Discussing effects of abrasion, erosion, corrosion and excessive heat, the document states that, to date, no materials or means have been dis-

covered which will effectively and completely resist all such actions. The Association advises buyers that guarantees covering such conditions cannot be made in good faith.

The standard also includes a sample specification sheet consisting of a check-list of modifications for fan construction and design, surface-preparation steps and procedures, and fan-component coating requirements.

Possibilities and combinations normally encountered in actual practice are included. Each entry in a specific category is an improvement or extension of those shown above it. Generally speaking, the farther one goes down the scale, the more expensive the preparation becomes. Of course, the quality of the finished product also improves.

The standard does not advise what degree of preparation is necessary for a particular coating. Neither does it try to suggest what coating is suitable for a specific corrosion problem.

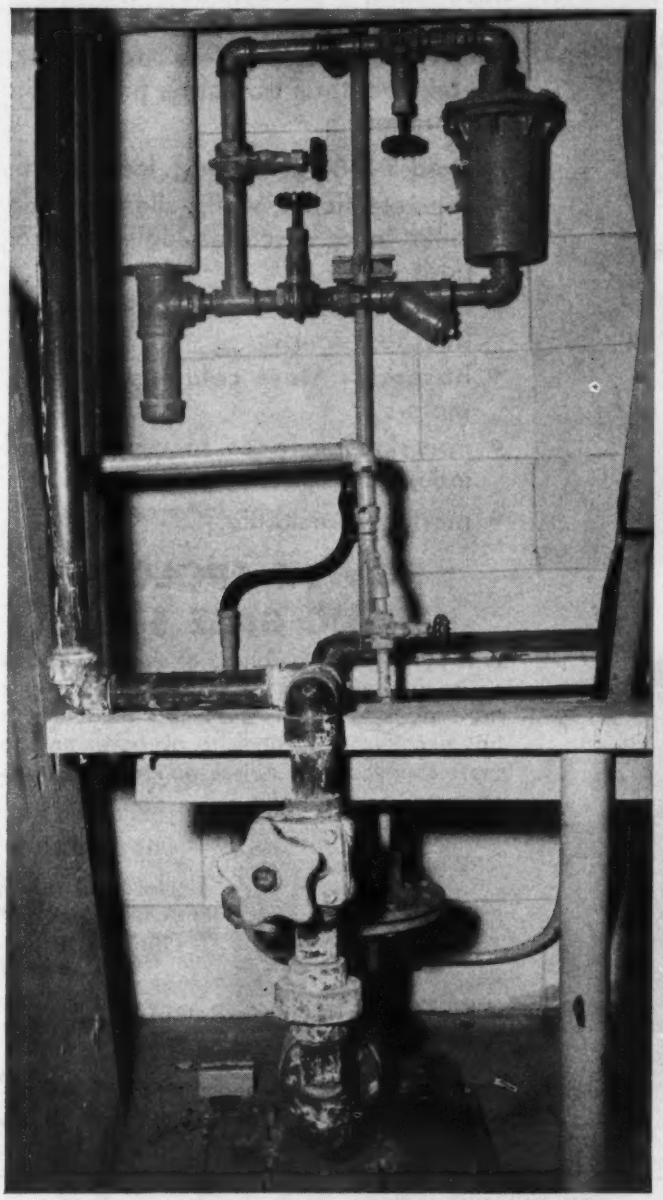
The document points out that these are functions of coating manufacturers and applicators. By its use, the specification writer, fan manufacturer, coating producer and applicator can now have a common understanding of what is to be done in preparing fans and blowers for coating.

(Copies of Code No. AP-2601, "AMCA Recommended Practice for Preparation of Fans and Fan Parts for Protective Coatings," may be obtained from Air Moving & Conditioning Association, Inc., 2159 Guardian Building, Detroit 26, Michigan.)

Check 4924 opposite last page.

METAL REFINING: New Role For Penton

Solid Penton pipe and fittings prove easy to install and maintain, and low in cost



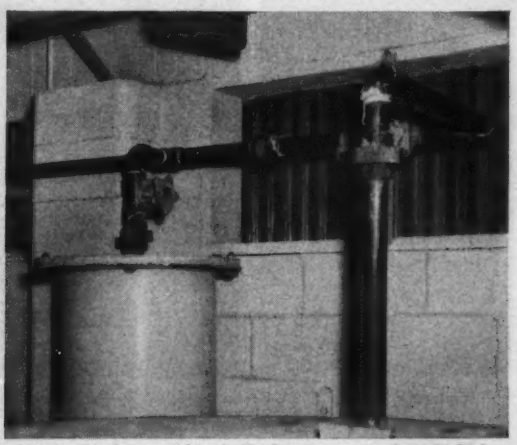
The Wah Chang Corporation has found an important new use for Penton at its Albany, Oregon, plant where columbite and tantalite ores are refined to obtain columbium and tantalum.

More than 100 feet of 1½ inch Schedule 80 pipe, threaded tees, 90° elbows, unions, and nipples—all made of solid Penton—are serving in transfer lines in the Wah Chang process, where columbium and tantalum are separated by liquid-liquid extraction and the oxide products are reduced to metal by carbon reduction.

In selecting the process equipment, Kenneth W. Bird, Process Engineer, says: "The extreme ease of installation and comparative cost of Penton pipe and fittings versus other materials which could handle this rough piping job, make Penton by far the most advantageous material we could employ. Our product must be of the highest purity, and Penton exhibits the greatest degree of inertness to the materials being handled of any competitive product on the market."

Write for complete facts about Penton and a list of fabricators and suppliers of Penton processing equipment.

Pipe and fittings used at Wah Chang were supplied by Tube Turns Plastics, Inc., Louisville, Ky., through its West Coast distributors, Eeco Corporation.



At left: Discharge side of diaphragm pump in which hot (210°F.) 15% HF solution and K_2TaF_7 (Potassium fluo tantalate) is transferred to crystallization tanks through Penton system of 1½" Schedule 80 pipe and threaded fittings. *Above:* Transfer line into crystallization tanks is solid Penton pipe.

**Penton is the Hercules Powder Company registered trademark for chlorinated polyether.*

HERCULES POWDER COMPANY
INCORPORATED
Hercules Tower, 910 Market Street, Wilmington 99, Delaware

CP61-9

Check 4925 opposite last page.

ELIMINATE CONCRETE EROSION WITH ROWE'S EPOLOID MASTIC BASE 5-E-84

IT SPRAYS...IT TROWELS...IT CURES ROCK-HARD

"DOLLAR-SAVER" best describes Epoloid Mastic Base 5-E-84. Mixed with "flint-shot" silica sand, it protects new concrete—resurfaces eroded concrete—easily, quickly, at a welcome low cost—lower, we believe, than any other product on the market.

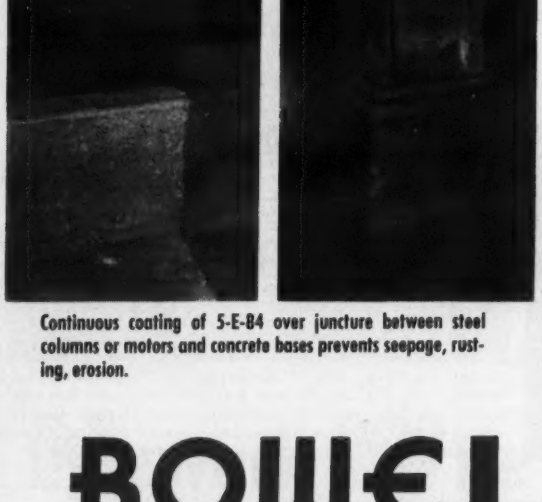
5-E-84 can be sprayed to trowel consistency 4 to 8 times faster than trowelling by hand. It can then be rolled speedily to a smooth finish.

Epoloid 5-E-84 gives long, long life to:

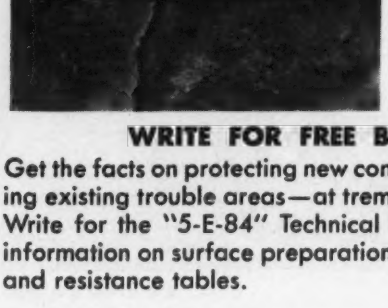
- concrete floors, walls, silos, holding tanks and cascade cooling tower pads.
- liners for salt brine tanks, waste trenches, sumps.
- bases for steel columns, pumps, motors.
- non-skid surfaces for ramps and industrial shower rooms.
- mortar for acid tile.

ROWE'S EPOLOID MASTIC BASE 5-E-84

...is a 100% solids blend of selected epoxy resins and plasticizers. It provides extreme hardness, yet retains maximum flexibility. It has excellent resistance to abrasion and to most chemicals. Requires no priming when sprayed, cures rapidly.



Continuous coating of 5-E-84 over juncture between steel columns or motors and concrete bases prevents seepage, rusting, erosion.



5-E-84 fills cracks, gives badly spalled, eroded floors a better-than-new surface.

WRITE FOR FREE BULLETIN

Get the facts on protecting new construction—on repairing existing trouble areas—at tremendous cost savings. Write for the "5-E-84" Technical Bulletin." It contains information on surface preparation, physical properties and resistance tables.

ROWE PRODUCTS INC.

COLLEGE AVENUE AND HYDE PARK BOULEVARD
NIAGARA FALLS, N. Y.—PHONE: BUTLER 5-9348

Specialists in protective coatings to the chemical process and allied industries since 1921.

Check 4926 opposite last page.

Curing method important in evaluating plastics for corrosive service

Tests show formula alone doesn't tell full story

Recent studies have shown that with some plastics it is necessary to consider the curing method in order to accurately determine the corrosion resistance of the material.

Examples are polyesters and epoxies. Comparisons were made between heat- and room-temperature cured castings of various polyesters and epoxy resins. Resins were immersed in eight corrosive aqueous solutions at 210°F and changes in their physical properties were noted at six months.

Heat-cured Samples

Of the heat-cured castings, only bisphenol-A polyester and metaphenylene diamine-cured epoxy showed any significant resistance. Under acidic conditions, the epoxy tended to break down.

Surface attack was noted after one month in 5% HNO_3 and the epoxy suffered complete deterioration in six months. In 25% acetic acid, flex strength retention of the epoxy was only 22% at six months. The casting became opaque in 25% H_2SO_4, 15% HCl and in the acetic acid and distilled water.

The epoxy exceeded the bisphenol polyester in flexural strength retention in only two solutions: 5% NaOH and Clorox. In all the other corrosive media, the polyester surpassed the epoxy in flex strength retention and visual characteristics.

Room-temperature Cured Samples

Marked differences in performance were shown by room-temperature cured samples of bisphenol-A polyester and triethylenetetramine-cured epoxy. The epoxy broke down completely in both HNO_3 and acetic acid. In H_2SO_4, majority of flexural strength was lost after six months.

Exposure to H_2SO_4, HCl and

acetic acid turned epoxy sample opaque and black. The TETA-cured samples retained considerable flexural strength and visual characteristics in Electrosol (a commercial detergent), caustic soda and Clorox.

Bisphenol-A polyester samples showed good over-all resistance, with HNO_3 causing greatest loss of flexural strength (49% retention). Only in Clorox did the TETA-cured epoxy outperform bisphenol-A.

(Tests were conducted by Chemicals Division, Atlas Powder Company, Wilmington 99, Delaware.) ■

Micarta joins with Teflon to yield strong tube that resists corrosion

Uses: Tube was developed primarily to transport corrosive liquids. It will also be suitable for use as bearings or bushings and in materials handling applications which require tube whose inner surface exhibits a very low coefficient of friction or extreme resistance to corrosive action.

Features: Teflon inner sleeve offers self-lubrication and chemical resistance. Micarta outer shell affords high physical strength.

Description: Inner lining of Teflon is bonded with outer sleeve of Micarta laminate. User supplies Teflon lining to manufacturer for bonding with Micarta shell. Tube can be produced with internal diameters ranging from 2 to 12" and with wall thicknesses ranging from ⅛ to 1". Maximum length is approximately 2'. Combination of Micarta and Teflon offers good dielectric properties.

(HY-380 tube is produced by Westinghouse Electric Corp., Micarta Div., Hampton, S.C.)

Check 4927 opposite last page.

Pricing information for wrought alloys is shown in 20-page list issued by Haynes Stellite Company, division of Union Carbide Corp.

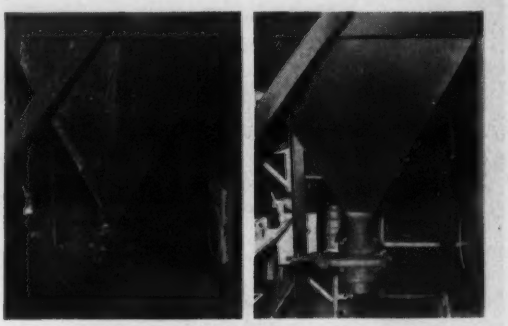
Check 4928 opposite last page.

Cut Maintenance Coating Costs In Half—or More With Rowe's Tough One-Coat Epoloid "K"

IT PRIMES...IT FINISHES—IN ONE COAT...IN ONE DAY

ONE product—Epoloid "K"—eliminates in ONE application ALL of these plant maintenance coating problems:

- Contamination between coats due to humidity and/or chemical environment
- Insufficient downtime hours to maintain structure and equipment in chemically active areas
- High cost of labor for paint application
- Large coating project with minimum man-hours available
- Economic imbalance between costs of coating materials and short-lived, ineffective protection
- Large crib stock that requires too much space, too large an investment and invites too much waste
- Delays in plant production due to in-progress painting



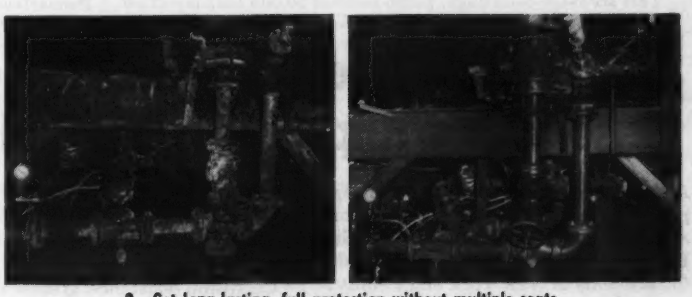
1—Get heavy mill build protection on sharp edges, nuts, bolts and other difficult contours.

2—Get same-day preparation and coating.

ROWE'S ONE-COAT EPOLOID "K"

...is a catalyzed epoxy, scientifically formulated with a blend of epoxy resins and plasticizers, combined with chemically resistant pigments. It may be brushed or sprayed on any clean surface, free of rust and foreign matter, to provide 4-6 dry mil thickness for full, long-life protection of surfaces and equipment.

SAVE (50% of labor costs of a two-coat (prime-finish) procedure (66% of labor costs of a three-coat (1 prime-2 finish) system



3—Get long-lasting, full protection without multiple coats.

ROWE PRODUCTS INC.

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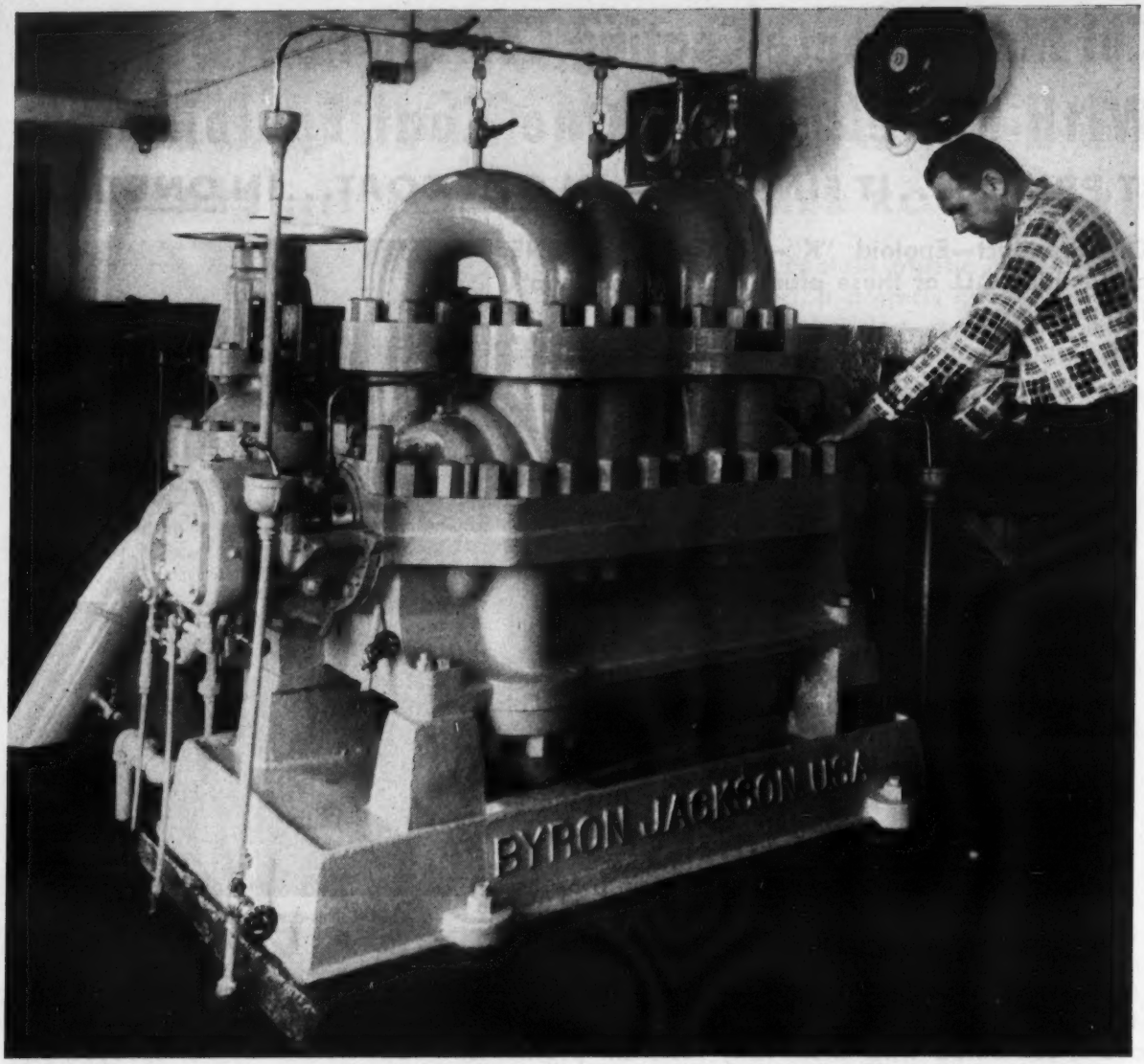
Specialists in protective coatings to the chemical process and allied industries since 1921.

Check 4929 opposite last page.



This six-stage centrifugal pump handles 50,000 bbl/day of oil fractions for the Atlantic Pipe Line Company of Philadelphia, Pennsylvania. Atlantic specifies Type I Ni-Resist interstage pieces to insure two years of service life between overhauls.

Atlantic Pipe Line specifies Ni-Resist cast iron for all pumps at Philadelphia station

A battery of Byron Jackson multistage pumps speeds petroleum products from Atlantic Pipe Line Company's Point Breeze Pumping Station, Philadelphia, to terminals in New York and Pennsylvania.

To insure 2 years of service life between overhauls, Atlantic specifies Ni-Resist* iron for the bearing-like interstage pieces of all their pipe-line pumps at this station: split bushings, wear rings, and center pieces.

Ni-Resist irons mean long life, infrequent replacements for corrosives-handling equipment. Where alkalies, acids, salts, oils, and plastics menace valves, pipes, and fittings, the Ni-Resist irons meet the threat with this combination of properties:

- Corrosion resistance, greater than that of unalloyed or low-alloy cast irons and steels
- Excellent corrosion-erosion resistance
- Heat and Wear Resistance
- Economy in casting, machining, and welding

A free 70-page booklet describes in detail the Ni-Resist Irons: how they perform in hundreds of corrosives; the industries they serve; the advantages they offer. A postcard will put "Engineering Properties and Applications of Ni-Resist" on your desk.

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street INCO New York 5, N. Y.

NI-RESIST
NICKEL MAKES ALLOYS PERFORM BETTER LONGER

Check 4930 opposite last page.

Mullite refractories resist corrosion, thermal shock

Uses: As batts, saggers and kiln furniture.

Features: Fused mullite refractories offer good resistance to corrosion and thermal shock. Material has high chemical purity and withstands temperatures up to 3340°F.

Description: Refractories are available in wide range of shapes and sizes. Product has slight excess of alumina over theoretical formula, $3Al_2O_3 \cdot 2SiO_2$. This reduces to a minimum the amount of "glass" that is often found in mullite and is cause of deformation or failure under load.

Relatively low thermal expansion and density combined with fair thermal conductivity account for material's excellent thermal shock resistance. Installed in a kiln operating at temperatures up to 3050°F, mullite saggers are still in use after 80 processing cycles. Conventional units used to last no more than 10 cycles.

(Mullite refractories are product of Refractories Division, Norton Co., Worcester, Mass.

Check 4931 opposite last page.

NEXT MONTH

Our 8th annual corrosion control feature will be presented in the August issue. The kick-off article will give you an up-to-date report of how chemical companies are organizing to fight corrosion — the foe that is costing American industry $6 billion a year.

How to get the most mileage out of glass-lined equipment, corrosion resistance of high-temperature alloys, things you should know about coatings, and CP's exclusive "corrosion keys" are other articles that you can't afford to miss.

Add to this, case history stories, condensed technical papers and articles about important corrosion control developments and you have a power-packed feature that is bound to be worth every minute of the time that you spend reading it. Be sure to look for it!

NEW LITERATURE

Corrosion Control

Chemical resistance chart highlights 16-page catalog reviewing protective coatings and synthetic rubber compounds. Chart lists performance of five series of coatings in over 75 chemicals. Bul 105 — David E. Long Corp.

Check 4932 opposite last page.

Drain lines made of Pyrex-brand glass are reviewed in 16-page catalog. Proper methods of installing are explained. Bul PE-30 — Corning Glass Works.

Check 4933 opposite last page.

Impervious graphite, counterflow, block heat exchangers are topic of eight-page illustrated catalog. Dimensions for five models are included. Installation sketches show six different mounting methods. Cat Section S-6813 — National Carbon Co., Div., Union Carbide Corp.

Check 4934 opposite last page.

Corrosion resistance of zirconium is detailed in 14-page book. Graphs for over 100 corrosive media in concentrations up to 100% and temperatures to 400° F are presented. "The Corrosion Resistance of Zirconium" — Zirconium Association.

Check 4935 opposite last page.

Two-page coating chart highlights bulletin discussing corrosion-resisting coatings. Description, number of coats needed, temperature range, chemical resistance are listed. Bul 100 — Carboline Co.

Check 4936 opposite last page.

Color standards and technical data are cited in four-page bulletin describing polyamide-cured epoxy coatings. Products approach hardness and durability of glazed ceramic tile. Twelve full-color chips are included. Bul P-52A — The Wilbur & Williams Co., Inc.

Check 4937 opposite last page.

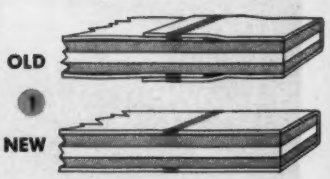
Liquid plastic cement that acts as vehicle and binder for powdered brazing alloys and simplifies their use, is described in two-page engineering data sheet 2.2.2 — Stainless Processing Division, Wall Colmonoy Corporation.

Check 4938 opposite last page.

Steel-corrosion cracking — a nontechnical introduction to the problem is topic of 30-page report. Environments most likely to cause stress corrosion cracking are reviewed. DMIC Report 144, PB 151 103, may be obtained by remitting 75 cents direct to OTS, U. S. Department of Commerce, Washington 25, D.C.

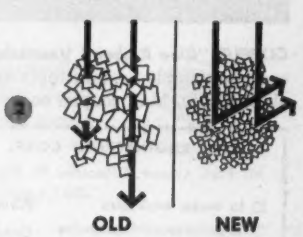
for
Chemical
Processing

New, improved Garlock Teflon-Jacketed Gaskets offer distinct advantages on glass-lined equipment. Two new design innovations have been added to the formed-shield type of gasket: (1) ends are now butt-welded instead of overlapped, resulting in a face of uniform thickness and elimination of "lump" at the seam; (2) a new, high-quality grade of Teflon is used, resulting in less permeability and chance of mechanical failure.



For positive sealing to withstand—but not contaminate—reactive blends, batches and mixtures, apply Garlock Teflon-Jacketed Gaskets. Wide variations of styles, filler materials, and sizes can be furnished to suit practically all process equipment including glass-lined piping, flanges and fittings. Call your local Garlock representative at the nearest of the 26 Garlock sales offices and warehouses throughout the U. S. and Canada. Or, write for Catalog AD-154. Garlock Inc., Palmyra, N. Y. **Canadian Div.:** Garlock of Canada Ltd. **Plastics Div.:** United States Gasket Co. **Order from the Garlock 2,000** . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

*DuPont Trademark



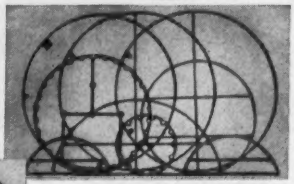
GARLOCK

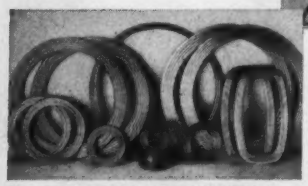
Check 4939 opposite last page.

For Uniform QUALITY....

Specify CHICAGO-WILCOX Gaskets

RING GASKETS
For ring-type flanged joints in high-pressure lines. Made of soft iron, standard steel alloys or any non-ferrous metal to any desired cross section. Ask for Bulletin 563.





HEAT EXCHANGER GASKETS Made in any size or shape needed in double-jacket type. Also cut from solid metal or sheet packing. Ask for Bulletin 564.

CORRUGATED METAL GASKETS Plain or jacketed type. Made of ingot iron, aluminum, stainless steel, copper, brass, nickel and monel in all sizes and shapes. Ask for Bulletin 565.

Prompt Deliveries

Write for literature and discounts.

CHICAGO-WILCOX MFG. CO.
7717 So. Avalon Ave., Chicago 19, Illinois

Check 4940 opposite last page.

COPPUS "Blue Ribbon" Ventilator-Blowers **are portable and easily adaptable . . . for supplying fresh air or discharging foul air or fumes. Mail coupon below for facts.**

COPPUS ENGINEERING CORP.
387 Park Avenue, Worcester 10, Mass.

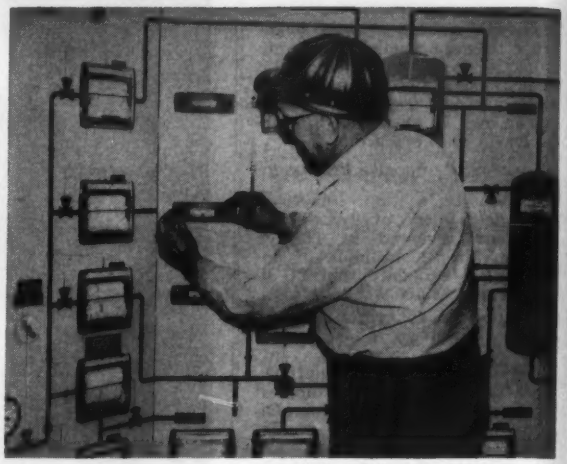
- ☐ in tanks, tank cars
- ☐ in underground manholes
- ☐ for exhausting welding fumes
- ☐ on boiler repair jobs
- ☐ for general man cooling
- ☐ to stir up stagnant air wherever men are working or material is drying

Name.....
Company.....
Address.....
City.....

COPPUS BLOWERS

Check 4941 opposite last page.

cp PROCESS INSTRUMENTATION and LABORATORY APPARATUS



Computer-control system used at Standard of California recognizes operator as essential link in loop, whether closed or open. Here head operator is switching from open- to closed-loop control

Operators call the shots in cracker-computer set-up

Using computer on fluid cat cracker, Standard Oil of California expects 2% increase in value of products

PROCESS-CONTROL computers are well on their way to becoming standard hardware in the oil industry. Standard Oil Company of California recently joined the growing ranks of computer-equipped refineries with an installation on a fluid catalytic cracker at El Segundo. Standard expects the computer to increase the value of products by at least 2%.

A NEW SOLUTIONS FEATURE

This system recognizes the operator as the essential link in the loop, whether closed or open. Standard sees it as an attractive tool to provide the operator with automatic, rapid, continuous calculations to gain optimum production.

In operation, the computer first scans the 75 points of information—temperatures, flow rates, pressures, etc—at an average rate of 40 points/minute. (Computer can scan a maximum of 20 points/second.)

This information is used by the com-

Oil industry is blueprint for CPI computer future

The oil industry has jumped far ahead of the CPI in general in the matter of utilization of computers for process control.

There are good reasons for this. Refining problems are relatively specialized and the industry is extremely competitive and heavily taxed. Because of these factors, oil companies have for years been quite advanced in the areas of process analysis, instrumentation and control.

Accordingly, the refineries were a good deal more prepared to take advantage of process-control computers when they came into being than was the CPI as a whole. It follows that what the oil industry does with computers now is undoubtedly a good indication of what the rest of the chemical producers will be doing with them in the future.

With the foregoing in mind, it is interesting to note that operators play a key role in refinery computer installations such as the one discussed in this article.

puter in calculating necessary controller settings to bring operating conditions back to maximum values. Most of the time new calculations occur every 15-20 minutes.

Operators Still 'Operate'

Operators themselves contributed significantly to planning of the communication phase of computer-system design. Most of the computer-control system is housed in a small building about 100' from the fluid-catalytic-cracker control room.

The operator in his control room communicates with the computer system through a small console with labeled switches and lights. With the console, he inserts new information into the computer's memory, modifies data on plant situation or calls for special action from the computer. Results of computer calculations then reach operator on a typewriter located beside the console.

The operator changes operating limits to reflect changes in equipment performance. He must have this facility because equipment performance varies under changing effects of ambient temperature, aging, fouling and the like.

If the operator makes a change in limits, he obtains at the end of his shift an estimate of amount of product value associated with this limit alteration. In effect, he receives a measure of value of being able to obtain more performance out of key items of plant equipment.

The operator must also have control over certain contingencies, and be able to modify computer behavior as required. For example, one of the 75 instruments which are scanned into the computer may become temporarily inoperative due to equipment failure or to removal from service for routine maintenance.

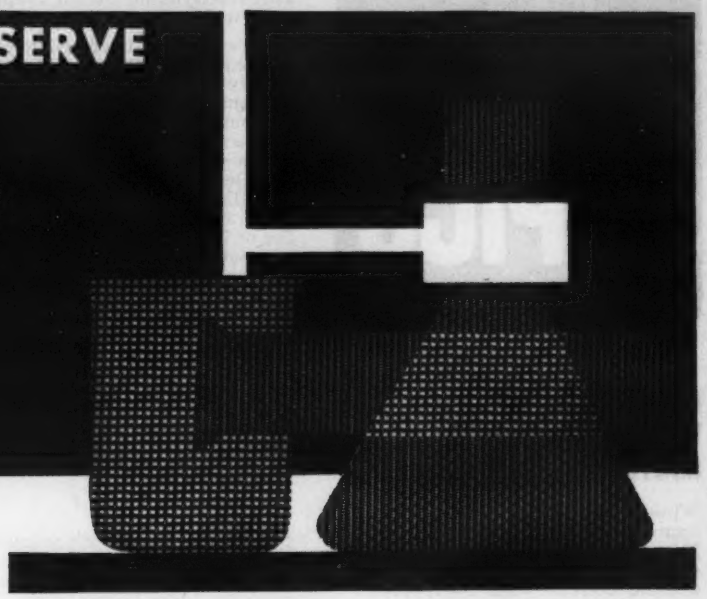
In such a case, the operator can inform the computer system that an instrument is out of service. He also indicates whether the computer program should use the last good

use wire cloth in critical operations?

THEN THEY DESERVE

Cambridge

WIRE CLOTH QUALITY & SERVICE



What is Cambridge Quality?

Wire that consistently meets metal or alloy analyses. Trained operators and modern looms to produce cloth from any metal or alloy in any weave. Constant inspection to assure high accuracy in mesh count and mesh size. Craftsmen to make fabrications in any size, shape or quantity to exacting specifications.

This is Cambridge Wire Cloth Quality.

What is Cambridge Service?

Prompt answers to mail or phone inquiries. Experienced Field Engineers—experts in their field—who can help you select the wire cloth to do the best job at lowest cost. Prompt deliveries. Large stocks of frequently used cloth for immediate shipment. Follow-up service to see that our product is giving you the results you want.

This is Cambridge Wire Cloth Service.

Your Cambridge Field Engineer can show you how Cambridge quality and service can help you in your operation. Call him at any time. He's listed in the Yellow Pages under "Wire Cloth". Or, write direct for illustrated 120-page catalog.

Refer to our technical data sheet in CHEMICAL ENGINEERING CATALOG, Page 185.

The Cambridge Wire Cloth Co.

Department: F • Cambridge 7, Maryland

Manufacturers of Metal-Mesh Conveyor Belts, Flat Wire Conveyor Belts, Wire Cloth, Wire Cloth Fabrications and Gripper ® Metal-Mesh Slings.

Check 4942 opposite last page.

SARCO TOPICS

A FAMOUS FLUID WITH TEMPERATURE CONTROL PROBLEMS

Wine has never been properly appreciated by enough people. Many think you simply press grapes, bottle the juice, and wait a while to create wine. Even those who pride themselves on their knowledge of this age-old drink are seldom aware of the artful thermal engineering required. Pasteurizing wine is actually one of the most tricky and delicate feats in the field of liquid processing.

Take temperatures. Wine must be pasteurized at 140°F. Those are the facts of life in the world of wine. They might not seem too difficult to live with unless you're in the wine or chemical processing business.

Take New York's Monarch Wine Company, producers of Manischewitz Wine. Their Problem: how to maintain the 140° temperature in the heat exchangers despite wide variations in the rate of wine flow. These variations, between 5 to 60 gallons per minute, result from slowdowns and recoveries in the bottling process. Problem: entire system must be capable of complete shutdown when necessary. Problem: wine temperatures must be raised to 140° as rapidly as possible, sometimes an immediate jump of 100°

Attracted perhaps by aspects of the situation that had little to do with pure science, Sarco engineers applied the collective experience of Sarco technology to the solution of this serious problem. The result for Monarch: the *degree of control* the process demanded—achieved through the excellent use of Sarco Temperature-Pressure Regulators, Float Thermostatic Steam Traps, Thermo-Dynamic Steam Traps, and Pipeline Strainers.

Sarco engineers, ever resourceful, divided each of the two large Cherry-Burrell plate-type heat exchanger units into two separate sections with a blank baffle plate, each with a separate Sarco control. Thermal sensing bulbs were installed in wine discharge and throttling controls hooked into steam supply. As demand fluctuates, one or both regulators function to maintain the 140° temperature.

In higher demand, both regulators are operative; as demand drops and flow decreases, only one regulator supplies steam. Pasteur himself would have been elated.

Each of six smaller capacity shell-and-tube heat exchangers required only one regulator, with the sensing bulb inserted into the outlet side of the wine filled shell, and the regulator throttling steam supply to the tube section. Thus, by controlling flow of steam to the exchangers on the basis of pressure and temperature, the Sarco regulators were able to maintain the temperature of the wine at precisely 140° regardless of fluctuations in demand or supply rate. Whew! A lot of engineering went into those two sentences.

From here on it's downhill. To secure complete cut off of the steam supply during scheduled shut-downs of the bottling run, solenoid valves were provided to supplement normal modulating action of the controls. To discharge widely varying loads of condensate continuously and remove immediately all air and incondensible gases, Sarco Float Thermostatic Steam Traps were installed on all condensate outlets. On the drips before each control valve a Sarco Thermo-Dynamic Steam Trap was installed to insure delivery of dry steam. Sarco Pipeline Strainers were installed before all steam traps and valves to protect them against damage by any foreign bodies. And thus ends a classic story of the grape.

Still, this story has been condensed far too much, really, and we feel you've been cheated out of the story's more delicious details. You needn't be, however. We've printed the facts in detail for posterity and you in Sarco Case History 185, complete with drawings that practically make it a do-it-yourself kit. If you would like a copy, we will be flattered to receive your request, and dispatch it with dispatch.

WE'RE ALWAYS IN . . . AND THE WELCOME MAT'S OUT

We always take it for granted that if you are going to be in the vicinity of our plant you'll phone or drop us a line so we can invite you to visit us. You'll find that our factory in Bethlehem, Pennsylvania, is on many well-travelled routes and that our steam laboratory has much to offer in interest and helpfulness. Forgive us for being immodest, but the lab is the most up-to-date of its kind in the country.

When you visit us, don't allow yourself to get sidetracked by the drill presses and automatic lathes. We're proud of this equipment but you've probably seen metal mutilated before, and it's our steam laboratory that's unique. We promise you a good show, and if you have any problems, bring them along. We'll solve them while you wait.

ANYONE FOR KEY CHAINS?

We seem to have these key chains. Want one? They're much more convenient than a case. A tiny replica of a Sarco Thermo-Dynamic Steam Trap, Type TD-50 is attached, but you can always remove it if you find it too commercial. There must be many things you could use these chains for. Fishing sinkers? Lengthening a light cord, maybe? Anyway, if your Sarco representative is out, write in.

Pardon our monopolizing the conversation in this series of paid communiques, but we're trying our best to interest you in certain subjects that concern us both—to the point where you'll communicate. 6354

SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.
STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

Check 4943 opposite last page.

value recorded in its memory or should use an override value selected by operator.

Also, the operator may wish to obtain a record of all flow rates during unusual operating periods. He can demand this type of information and have it printed out on a second typewriter in control room.

Insurance against possible mistakes is provided. A detailed check-and-balance system is built into the computer system. Any changes made by the operator in key equipment limits must pass reasonableness tests. These have been determined in advance and recorded in the computer's memory.

If the operator inadvertently makes an entry which does not meet these checks, he receives a message on the typewriter, stating that an error has been made and that the computer system will not recognize the proposed change. On the other hand, if the entry of operator meets all tests, he receives a confirming message on the typewriter.

The system is designed so that the operator can close the loop on the most important control variables. He can instruct the computer system to change cracking-plant controls according to its own calculations.

Both research engineers and operating personnel believe that use of the closed-loop feature will become a regular practice.

(Process-control computer used in this installation is product of Data Processing Division, International Business Machines Corporation, 112 E. Post Rd., White Plains, N.Y.)

Check 4944 opposite last page.

Gas-chromatograph applications in various chemical and petroleum processes are detailed in 14 data sheets. These each give general descriptions of process, explain analyses which can be made by chromatograph and (where necessary) list accessory components which are needed. Process Vapor Fractometer Data Sheet—Instrument Division, Perkin-Elmer Corp.

Check 4945 opposite last page.

Laboratory Report

Wash-bottle first

. . . is this flexible polyethylene model especially designed and fabricated for this purpose. Bottles have molded leak-proof connection for tube located in shoulder instead of cap. Tube can be adjusted by snipping tip with scissors.

(Polyethylene wash bottle is product of The Nalge Co., Inc., 75 Panorama Creek Dr., Rochester 2, N.Y.)

Check 4946 opposite last page.

Titrate to within ±0.1 pH in 1 to 1½ minutes

Uses: Titrations in which end-point can be related to reproducible electrode potential, including pH, redox and conductometric procedures.

Features: Titrator is accurate to within ±0.1 pH elapsed time of 1 to 1½ minutes. Acutation-potential sensitivity is two millivolts.

Description: Automatic laboratory titrator incorporates electronic sensing of end point and progressive restriction of titrant flow as end point is approached. Instrument has operating and cycle-completion signal lights as well as automatically controlled magnetic stirring.

(Titrion laboratory titrator is product of Coleman Instruments, Inc., 42 Madison St., Maywood, Ill.)

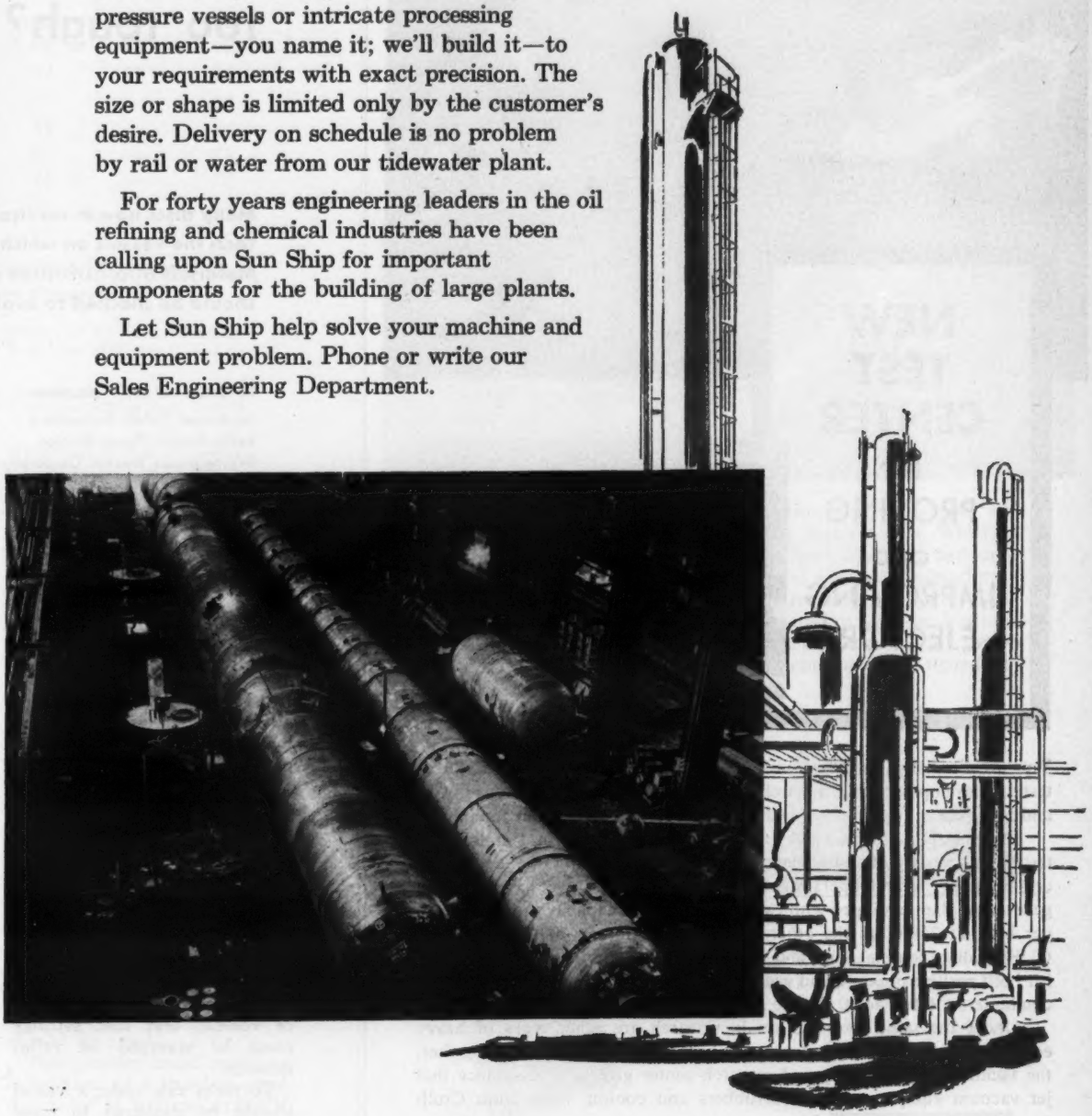
Check 4947 opposite last page.

. . . to your order

Debutinizers, exchangers, fractionating towers, pressure vessels or intricate processing equipment—you name it; we'll build it—to your requirements with exact precision. The size or shape is limited only by the customer's desire. Delivery on schedule is no problem by rail or water from our tidewater plant.

For forty years engineering leaders in the oil refining and chemical industries have been calling upon Sun Ship for important components for the building of large plants.

Let Sun Ship help solve your machine and equipment problem. Phone or write our Sales Engineering Department.



Sun

SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE • SINCE 1916 • CHESTER, PA.

Check 4948 opposite last page.

FIVE-STAGE EVACTOR AND BOOSTER

NEW TEST CENTER for PROVING and IMPROVING EJECTORS

You are cordially invited to visit this new building devoted entirely to testing, development and research. Here you will see facilities as modern and complete as any existing for the testing of steam jet vacuum equipment.

Floor space and test blocks are sufficient to permit the simultaneous testing of a variety of equipment along with special testing of vacuum processing under actual operating conditions. To assist, we have a steam generating plant equipped with two boilers: one of capacity up to 25,000# per hour at 250# ga; the other, 4,000# per hour at 600# ga. Also: a 60,000-gallon cooling pond and assorted liquid pumps up to 3,000 gpm for both positive pressure and vacuum service; a 4,000 square foot surface condenser; a 6-ton hoist.

Under the same roof for use in research are other types of heavy equipment and laboratory instruments of most accurate design. All together, the facilities of our testing and research center give extra assurance that jet vacuum equipment, fume scrubbers and cooling units from Croll-Reynolds will perform exactly as specified.

CROLL C R REYNOLDS

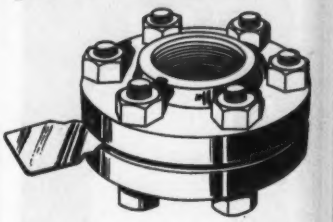
Croll-Reynolds CO., INC.

Main Office: 751 Central Avenue, Westfield, N. J.

Chill-VACTORS® • Steam-Jet EVACTORS® • Aqua-VACTORS® • Fume Scrubbers • Special Jet Apparatus

Check 4949 opposite last page.

Are your rupture discs too tough?



Many discs now in service are much stronger than the vessels on which they are installed. Materials of construction and temperature ratings should be checked to avoid this dangerous situation

By **WILLIAM WAY ALLISON**

Supervisor, Safety Engineering
Bettis Atomic Power Division
Westinghouse Electric Corporation
Pittsburgh, Pa.

AS IS THE CASE with most safety devices, improperly selected rupture discs can be more dangerous than none at all since they breed a false sense of complacency. There are some frequently overlooked stumbling blocks in the path of proper selection and use of rupture discs.

The ASME Boiler and Pressure Vessel Code (Section VIII) correctly requires that all pressure vessels must be equipped with ASME-approved pressure-relieving devices, that pressure settings of relief devices must not exceed Maximum Allowable Safe Working Pressures (MAWP) of vessels, and that settings must be stamped on relief devices.

To meet this code, a vessel should be designed to meet a MAWP of 20-25% above anticipated operating pressure, and should be designed to use a rupture disc with burst rating not exceeding the MAWP.

Unmarked Discs Are Dangerous

Many rupture discs in service today do not have bursting pressures stamped on them. The reason is simple: In many cases, there simply is not enough room for old-style large-flange-type rupture-disc holders. This version permits use of stamped ratings on the disc.

Investigations have proved that many of these unmarked discs have bursting pressures far above the design MAWP of vessels. Other cases have been found where two discs had been inadvertently used instead of one. Rupture pressures should be stamped on tabs attached to discs. Types of safety heads which do not permit the use of discs with tabs for ratings stampings should not be employed.

Materials and Temperature Are Twin Pitfalls

Selection of the wrong material and wrong temperature rating is another commonly-overlooked hazard in specifying rupture discs. The effects of elevated temperatures on rupture discs is marked and varies sharply with type of disc material. (This point is illustrated by the data pre-

Temperature, °F	Inconel %	Stainless-steel %	Monel %	Aluminum %	Nickel %
72	100	100	100	100	100
100	99	96	97	98	99
200	95	85	91	88	95
300	94	76	87	—	93
500	94	69	82	—	86
600	94	68	81	—	81
700	93	—	78	—	75
800	92	—	75	—	—
900	91	—	—	—	—

Approximate Effect of Elevated Temperatures on Disc Rupture Pressure

Example 1: To determine rupture pressure at 500°F of a stainless-steel disc rated at 3000 psi at 72°F, multiply 3000 psi × 0.69 = 2070 psi at 500°F.

Example 2: To determine rupture pressure at 72°F of a stainless steel disc rated at 3000 psi at 500°F, divide 3000 by 0.69 = 4348 psi at 72°F.

Example 3: To determine rupture pressure at 72°F of an Inconel disc that is rated at 3000 psi at 500°F, divide 3000 psi by 0.92 = 3190 psi at 72°F.

sented in table shown above.)

From sample calculations given with table, it can be seen that the Inconel disc changes its relieving pressure only by 190 psi with 428°F change in temperature. On the other hand, the stainless-steel disc changes pressure at which it will release by 930 psi for the same 428°F temperature change.

Which Temperature Should Be Used?

It is common practice for engineers to specify a rupture disc that has a bursting pressure and temperature rating the same or somewhat above the MAWP and temperature of the system that the disc is supposed to protect. This seems logical enough on the surface. However, a rupture disc rarely "sees" a system's operating temperature.

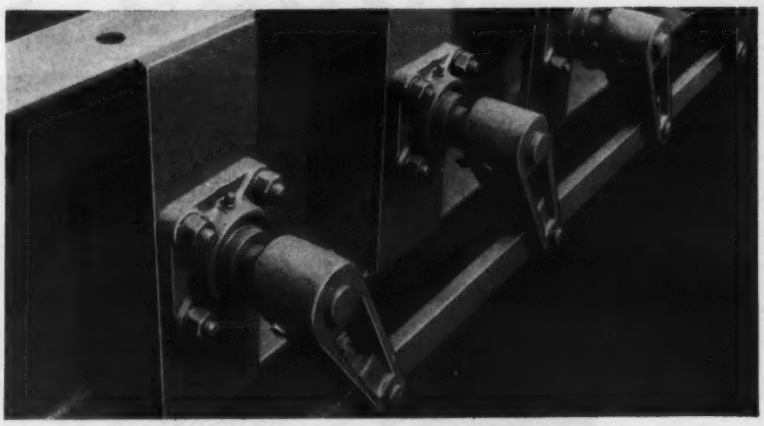
Field inspections and temperature readings indicate that a disc normally "sees" a temperature far below that of the system. In most cases it "sees" room temperature, or about 72°F. If a stainless-steel disc rated at 2070 psi at 500°F is used and the disc "sees" only 72°F, it will not rupture and release excess pressure until pressure in the vessel reaches 3000 psig (vessel temperature of 1030°F).

Some rupture-disc authorities have conservatively recommended that rupture discs be selected with bursting pressures 50% above normal operating pressures. This is suggested to insure against unnecessary loss of valuable vessel contents through premature disc bursting. The trouble is that the design or operating engineer sometimes misinterprets this statement to mean that a disc 50% above the MAWP of the vessel should be used.

This practice could result in installation of a stainless-steel disc rated at 3000 psi at 500°F on a high-pressure system which has a MAWP of 2070 psi at 500°F. The system could then reach a pressure of about 4348 psi and would rupture before the disc. If an Inconel disc is used and the same error is made, the disc would rupture at 3190 psi and save the vessel. ■

CUSTOM-DESIGNED DAMPERS

FOR POSITIVE DRAFT CONTROL



Whirlex multi-louvered dampers give positive control of your draft problems. Whatever your requirements, Whirlex dampers are custom-engineered, in both louvered and opposed-blade designs, for all types and sizes of applications. And, whether in difficult conditions requiring gas-tight seals and closure strips, or linkages for operating with combustion control equipment, or dust-seal equipped bearings for pressure systems, Whirlex offers equipment *custom designed* to meet your needs.

Whirlex all-welded dampers are completely integrated and shop-assembled. They assure you of quality controlled, high-efficiency equipment with a consistently low operating and maintenance cost.

Remember, when Whirlex multi-louvered dampers work for you, you get the *best* draft control for the *least* cost. Ask for bulletin #DA-16

THE FLY ASH ARRESTOR CORP

205 North 1st Street — Birmingham, Alabama

420 Lexington Avenue — New York 17, New York

Mechanical Collectors — Wet Collectors
Induced Draft Fans — Forced Draft Fans — Exhaust Fans
Self Supporting Stacks — Duct Work

Check 4950 opposite last page.

ideas and news:

Up to 35 square feet of screening area in only 16 square feet of floor space: Stacked-deck design of this gyratory screen conserves valuable space. Cuts maintenance, downtime with all-stainless-steel construction. Abrasive or corrosive materials, dry foods and pharmaceuticals are handled with care. Gentle, quiet, vibrationless operation means minimum disintegration of fragile particles.

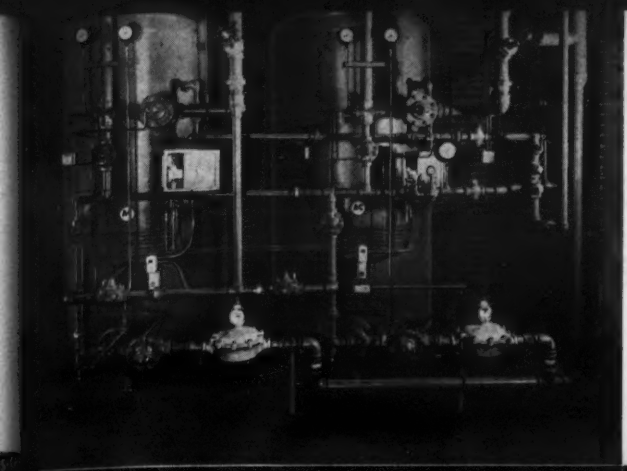
Silicon rectifiers can be located anywhere in the plant. Designed especially for large electrochemical or industrial applications where space, heat or dirty atmospheres are a problem, these silicon rectifiers employ water-to-water heat exchanger equipment. No special room is required — no need for clean air for cooling. Smaller compartment sizes save floor space. Cells can be removed without disturbing the cooling system. Reactor cores eliminate need for matched cells, surge capacitors protect against voltage surges, and current-limiting fuses provide cell protection.

Which of these productive ideas could be working for you?

A continuous mechanical agglomeration process that makes waste materials pay. A steam turbine-generator with dual-purpose flexibility. A gyratory screen that saves space. These examples demonstrate the extra value that is standard with Allis-Chalmers . . . the greater efficiency and the added productivity which are yours when you buy A-C products, systems and services. Call your Allis-Chalmers representative for details on A-C "worth-more" features. Or write Allis-Chalmers, Industries Group, Milwaukee 1, Wisconsin.

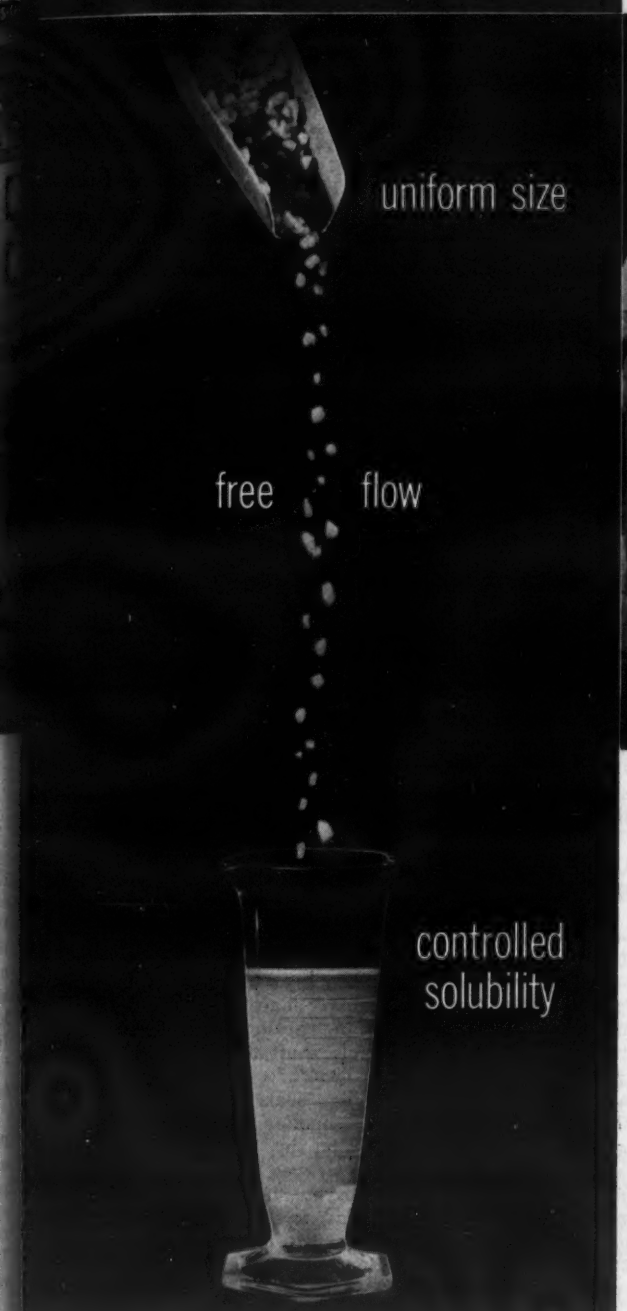
Compactor is an Allis-Chalmers trademark. A-1480

Check 4951 opposite last page.



Calcium and magnesium are the "vandals" that cause scale in pipes and boilers, clog systems and mean heavy use of cleaning compounds. ZEOLITE is their natural enemy! An A-C zeolite water softener means a simple switch to sodium ions from the usual hardness present in most water supplies. Once A-C conditioned, the "softened" water finds ready use in chemical plants to end scaling problems.

Even the by-product makes an economy contribution: Versatile . . . describes these two 6250-kw condensing, automatic extraction steam turbine-generator units installed in a midwest petrochemical plant. A typical application supplying steam to a process with electric power as an economical by-product. A-C manufactures a complete line of condensing and non-condensing turbine-generator units, with or without automatic extraction, for the chemical industry. For complete information on types and ratings from 2000 kw to the largest, ask for bulletins 7654A and 9448.



Profit recovery starts with waste: The continuous mechanical compacting process recovers virtually 100% of waste fines! It compacts and screens your waste material into flakes. Then granulates them into desired product. The same process tightens your production controls when you face problems involving granular size, density, solubility and other physical properties. Integrates smoothly into your system. Requires less power, lower capital investment than less modern agglomeration methods.

ALLIS-CHALMERS PRODUCTS FOR THE CHEMICAL INDUSTRY: Look to A-C for atomic, thermal and hydro electrical generating equipment; Compactor mills; compressors; control; coolers; crushers; dryers; earth-moving equipment; engines; grinding mills; industrial systems; kilns; lift trucks; motors; pumps; rectifiers; screens; switchgear; tractors; transformers; unit substations.

ALLIS-CHALMERS

Four tons of valuable dust are recovered daily by this Dustube Collector, ventilating the processing of sintered phosphate ores in a prominent chemical plant.

Dustube® collectors beat the heat in fume control

A demonstration of WHEELABRATOR'S

VITAL VALUES

Chemical and metallurgical process gases, with temperatures far beyond the range of conventional synthetic fabrics, are no problem to Wheelabrator dust and fume control systems. Dustube collectors equipped with special filtering fabrics, such as silicone-treated fiberglass, have the Vital Capacity to withstand acids, alkalis, or abrasive materials encountered in specific applications, and filtering at temperatures to 550°F, eliminate the need for costly pre-cooling equipment. Since dust is collected in the dry state and removed by repressuring or shaking, recovery of valuable materials is facilitated. Collection efficiencies above 99% are normal. For engineering consultation on your dust and fume control problems, call on Wheelabrator. Write for bulletin 562-D.

VITAL VALUES FOR INDUSTRY

WHEELABRATOR DUST AND FUME CONTROL

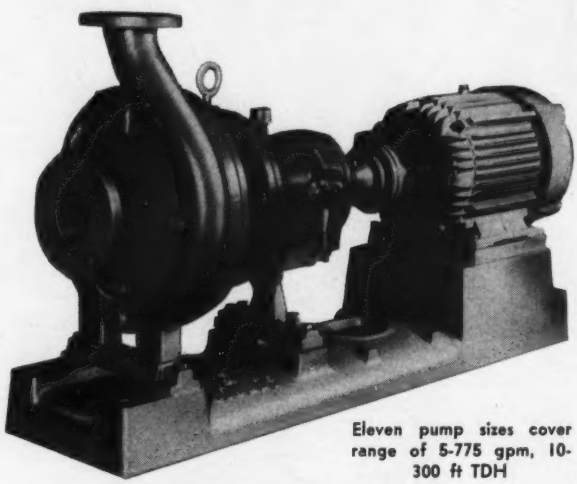
WHEELABRATOR CORPORATION, 478 S. Byrkit St., Mishawaka, Ind.
In Canada, WHEELABRATOR CORP. of Canada, Ltd. P.O. Box 490, Scarborough, Ont.

Check 4952 opposite last page.

PLANT ENGINEERING, SAFETY AND FLUIDS HANDLING

Standard pump design eases installation, maintenance

Handles corrosive, abrasive, clear liquids or slurries — at temperatures from −350° to 500°F



Eleven pump sizes cover range of 5-775 gpm, 10-300 ft TDH

Uses: Designed especially for the chemical processing industry, pumps will handle corrosive and abrasive chemicals, clear liquids or slurries in the temperature range of −350° to 500°F.

Features: Design provides for maximum dimensional interchangeability between all pumps and parts. A single pump length is used for all sizes, one coupling fits all sizes, dimension of suction to center line of discharge is standard for all. Design permits easy replacement of parts without disturbing pipe connections or motor mountings.

Description: Complete line consists of 11 pumps all stocked in three standard constructions of ductile iron, 316 stainless steel and Gould-A-Loy 20. The line is also available in any machinable alloy for any other special requirement.

Eleven casing sizes and three impeller-diameter series provide for a wide range of requirements.

Stuffing-box cover is available either with or without water cooling; when operating temperature is more than 350°F, water cooling is desirable. Stuffing-box jacket may be filled with steam or heat-transfer liquid when the pump is used to move high-melting-point or high-viscosity liquids.

Liquid-handling end of pump can be adapted to the driver through any one of three sizes of pump shafts equipped with the corresponding bearing. Maximum total dynamic shaft deflection at face of stuffing box for applicable shaft diameter is less than 0.002″.

Teflon seals protect shafts and impeller threads from corrosion by pumped liquid. Shaft sleeves, when used, are pin-driven hook type, with one end free to expand with temperature changes.

Bearing adjacent to the

To page 112

THAT'S INTERESTING

Underwater expediter

Encasing anti-submarine missiles in an envelope of gas may double missile's speed, experiments conducted by General Dynamics' Convair Division indicate.

Water clinging to surface of underwater body acts as drag, slowing it. With gas envelope, missile, in effect, would be moving through gas—water couldn't cling to its skin.

Gaseous envelope has been created by heating vehicle or building into it material which, in reaction with sea water, creates heat and vapor.

Automated TV on tap

Broadcast programming and station business procedures for television station of future will be controlled by computer, RCA predicts.

The company recently showed a model of such equipment.

For more information on product at right, specify 4953 see information request blank opposite last page.

A telephone call brings out the best in him

The dictionary lists twenty-two definitions for the word service. For Tony Arobone there should be a twenty-third.

In his ten years of sales engineering for K & M, Tony has evolved a very personal and particular notion of what service means. But we doubt if he could (or would) put it into words. He's a doer, not a talker.

His customers can tell you about it. Tony's the guy you call when you need help. That includes help in working out valve specs, hounding the factory to ensure on-time delivery, supervising installation and hook-up—even getting a replacement part for you in a hurry (his service doesn't end with the ringing-up of the sale).

Tony's readiness to assist customers in any and every way isn't simply a matter of knowing which side your bread is buttered on—although it is obviously good business. A former working engineer himself, Tony knows what it's like to bear project responsibility, and a good bit of his desire to be helpful can be ascribed to honest identification with the man on the other side of the desk. He has been in your shoes, and he knows they sometimes pinch.

Most K & M representatives are former practicing engineers. When you sit down with them to talk over a valving job, you'll find they speak your language.

K&M

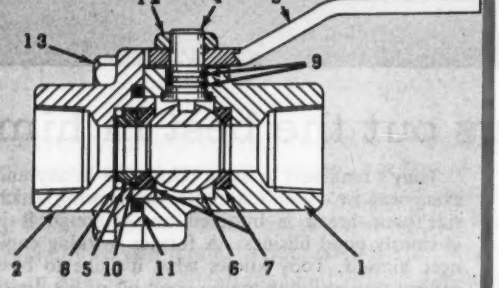
KIELEY & MUELLER, INCORPORATED

64 Genung Street, Middletown, New York

Eighty-two Years of Service to the Process and Power Industries

NOW —*at last*— a low-cost, precision-built BALL VALVE!

WITH AUTO-MATING SEATS OF BUNA "N" OR TEFLON*



BODY (1) and **CAP** (2)—Forged Naval Bronze; **HANDLE** (3)—Malleable Iron; **STEM** (4), **DISC** (5) and **BALL** (6)—Naval Bronze; **SEAT** (7)—Buna "N" or Teflon; **SPRING** (8)—Phosphor Bronze; **O-RINGS** (9, 10, 11)—Buna "N" or Viton; **NUT** (12)—Cadmium Plated; **SCREW** (13)—Carbon Steel

Take a good look at it!..

It's the ball valve you've been waiting for... the **R-P&C BL-300**... for dependable, trouble-free operation in water, oil and gas service. It is an entirely new concept in ball valve design—a combination of special features perfected with but one objective: *to provide you with a precision-built ball valve that costs no more than a high quality, standard bronze gate valve.*

The **BL-300** has undergone hundreds of thousands of openings and closings without leakage or wear. It is fast and easy to operate, requiring only a quick quarter-turn of the handle to open and close, compared to several full turns needed to operate a gate or globe valve.

In every way the **BL-300** is truly outstanding... a triumph of modern valve technology. We invite you to view every precision detail of this new low-cost ball valve in a personal demonstration with your R-P&C distributor. Or, write us at Reading, Pa., and we will gladly send you descriptive **Folder DH-38A** containing complete product information and specifications.

FEATURES...FEATURES...FEATURES

- The **BL-300** has "auto-mating" seats to assure positive sealing in either flow direction, making it ideal for vacuum service.
- Perfectly machined ball combines with auto-mating seats for smooth, positive valve operation.
- Wiping action of ball across seats prevents accumulation of foreign matter, eliminates maintenance.
- Choice of two seats—Buna "N" or Teflon—for your service requirements.
- Two "O" ring stem seals assure a leak-proof stuffing box for the entire service life of the valve.
- With Buna "N" seats, the **BL-300** is rated for 300 psi —water, oil, gas—at 250°F maximum; with Teflon seats, 300 psi—wog—at 450°F maximum.

*Teflon is a registered trademark of the E. I. DuPont de Nemours Co.

R-P&C VALVES

R-P&C Valve Division • American Chain & Cable Company, Inc.

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO

Check 4954 opposite last page.

From page 110

casing is free to float within the frame and carries radial load only. Outboard bearing is locked and carries both radial load and unbalanced axial-thrust load.

When packed stuffing boxes are used they are designed for five rings of ⅜" square packing plus a seal cage with ⅛" allowed for entrance of gland into the box. Provision is made for external lubrication.

Stuffing box gland is of the split type to permit easy packing.

When mechanical seals are specified, design is such that the following styles may be used: 1) Inside unbalanced seal, 2) Inside balanced seal, 3) Outside unbalanced seal, 4) Double inside seal, 5) Circo-flex seal.

(Model 3195 horizontal end suction single-stage centrifugal chemical pump is a product of Goulds Pumps, Inc., 75 Falls Street, Seneca Falls, New York.)

Check 4955 opposite last page.

Safety Slants

The eyes have it

. . . this month in our Safety Slants Section. Here is a special review of some of the latest developments in eye-protection equipment:

Arm for safety with these lightweight side-arm attachements for combining safety caps with goggles. Attachments permit quick connect-disconnect through minor adaptation of standard attachment (a kind of universal joint that can interchange goggle or goggles with most other of

manufacturer's welding helmet or face shields.)

(Side-attachments are covered in Bul 71—The Fibre-Metal Products Company, 5th & Tilghman Sts., Chester, Pa.)

Check 4956 opposite last page.

Two manufacturers have recently announced plastic sideshields for safety glasses:

A flat half-type plastic sideshield is available in crystal-clear or green for plastic safety glasses.

(Clear-Vue sideshields are product of Willson Products Division, Ray-O-Vac Co., Reading, Pa.)

Check 4957 opposite last page.

Plastic sideshields permanently attached to temples, are available for manufacturer's safety glasses. There are clean and green shields.

(Plastic sideshields are product of Fendall Company, 2222 W. Diversey Parkway, Chicago 47, Ill.)

Check 4958 opposite last page.

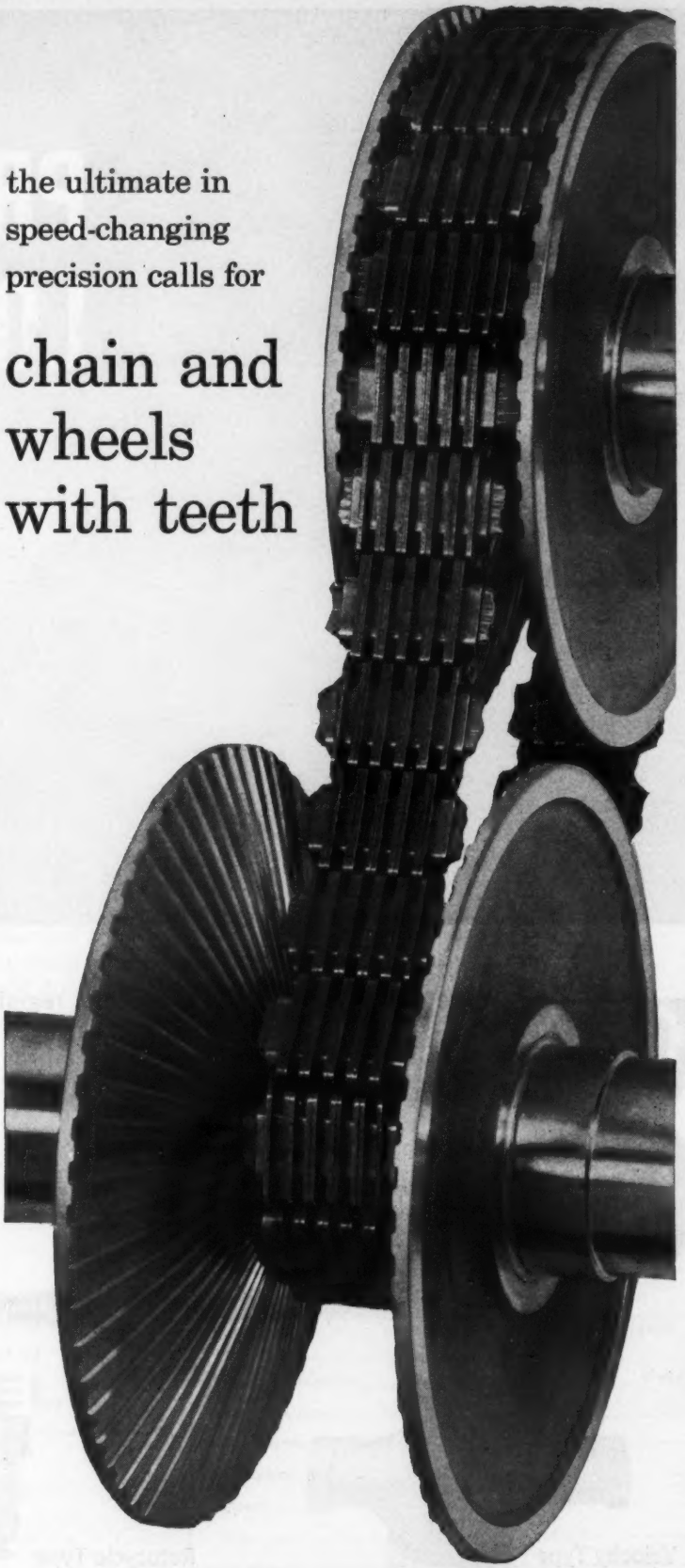
Don't forget your visitors when it comes to safety. Goggles for them, such as those pictured above, are a good idea. Frames and temples are made of smoke-gray acetate. Spatula-type temples are incorporated along with clear nose pad. Temples can be imprinted with company name.

(G531 Visitor's goggles are product of Pulmosan Safety Equipment Corp., 644 Pacific St., Brooklyn 17, N.Y.)

Check 4959 opposite last page.

the ultimate in speed-changing precision calls for

chain and wheels with teeth



LINK-BELT P.I.V.

Positive, Infinitely Variable accuracy with industry's only chain-driven speed changer

Variable from maximum to minimum speeds—with no steps or stops in between—Link-Belt P.I.V. is the answer to speed-changing applications that won't tolerate slippage.

Unusual speed control accuracy results from P.I.V.'s unique design featuring *wheels and chain with teeth*. The two pairs of conical wheels act as gears . . . mesh with self-tooth-forming chain to assure positive contact under all speed and load conditions.

A turn of the control screw changes the speed. The control screw simultaneously varies the effective diameters of the conically shaped wheels—closing one pair, spreading the other. This automatically, *instantly* adjusts the chain to provide a different output speed.

Contact your Link-Belt office or authorized distributor for more information about P.I.V. drives, ½ to 25 hp. Send for catalog.

LINK-BELT

VARIABLE-SPEED DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World. 15,650

Check 4960 opposite last page.

Chemical Boobytraps

Unsuspected hazards awaiting the unwary

Watch your step with Hg dry cells

Within recent years, two explosions involving mercury dry cells have occurred at the National Reactor Testing Station. One was a 1.3v battery from a remote radiation chamber. Along with nine others, this battery was replaced after six months' use and thrown into a metal waste basket. Shortly thereafter, one of the batteries exploded, sending 1 x 3" cartridge ricocheting off the ceiling. Considerable fine particulate matter settled out on bench tops throughout laboratory.

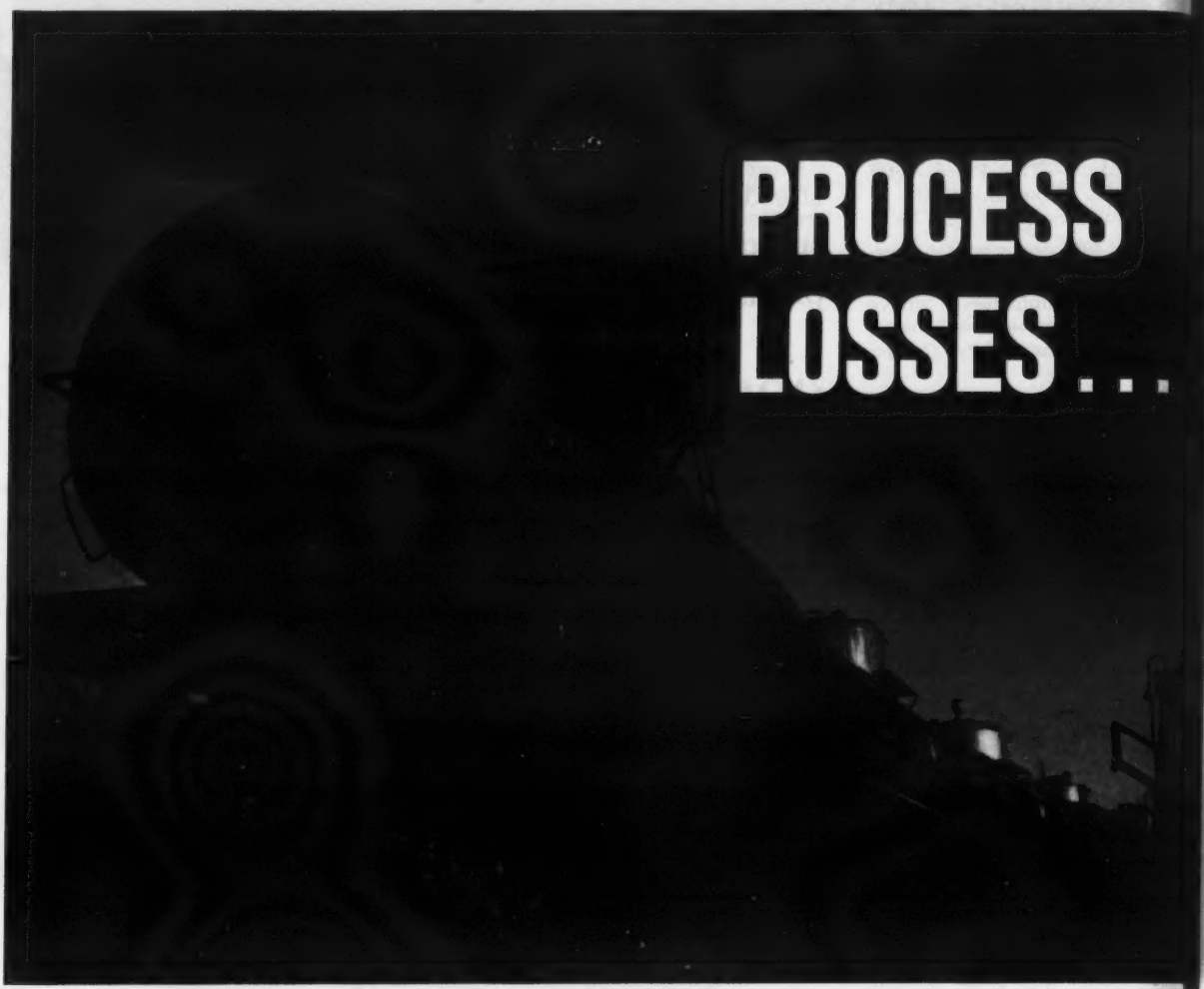
The second incident involved fifty cells, each 1-¼ x 2-⅜", which were in a calibration unit. This had been in use but was not believed to be energized at the time of the explosion. Back of the calibration unit was dished out and the black cell materials were sprayed from the cracks in the unit. Further examination revealed that about 25 cells had ruptured, severely damaging the unit. However, there was no evidence of fire or burning.

Two types of explosions have been suggested. One is that a prolonged short circuit increases internal temperature, thus vaporizing the mercury. When sufficient pressure is produced, the cell explodes.

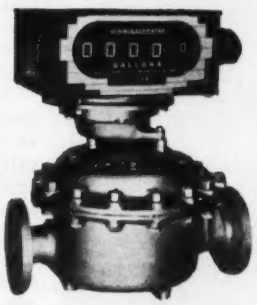
The Bureau of Ships, Department of the Navy, attributes another type of explosion to a hydrogen formation when the cell is forced to pass current after the end of its useful life. A weak cell in a series passes current like a resistor. As a result, water in the cell is electrolyzed to hydrogen and oxygen. Hydrogen pressure or sufficient heat to ignite the hydrogen will cause the battery to explode.

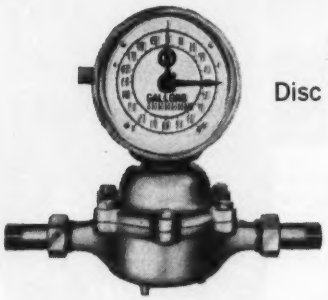
Recommended precautions are:

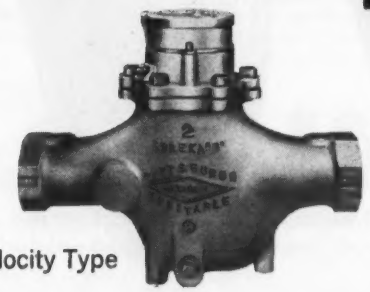
1) Never use a cell past the

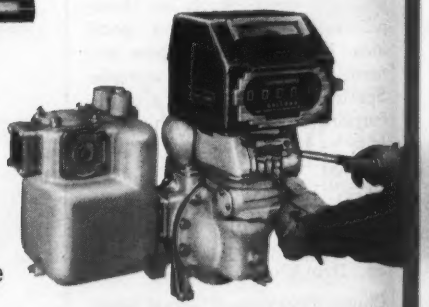


The only complete line of meters, registers and automatic controls to suit your every need


Piston Type


Disc Type


Velocity Type


Rotocycle Type

point where its voltage is insufficient to do its required work.

2) Make frequent surveys on the dates of batteries in storage. Discard those which are older than the "place in use before" date stamped on the battery.

3) Store batteries in a well ventilated area.

4) Do not retain exhausted batteries. Dead batteries should be discarded as soon as possible. Multicell batteries with steel jackets should be punctured to release any gas which may have formed. All cells to be disposed of should be carefully stacked in rows to prevent shorting across the positive and negative terminals. A piece of tape across the terminals also insulates against short circuits. It may be of interest that some mercury reclaiming industries are buying used cells and will provide wooden crates which are excellent for storage and shipping.

(Submitted by Bruce J. Held, Industrial Hygiene Engineer, Hazards Control Branch, Health and Safety Division, Idaho Operations Office, U.S. Atomic Energy Commission, Box 2108, Idaho Falls, Idaho.)

CP cops safety award for 7th straight year

The National Safety Council's Public Interest Awards list for 1960 again included CHEMICAL PROCESSING. This is the seventh consecutive year CP has been accorded this honor.

"Because the awards are noncompetitive," according to NSC President, Howard Pyle, "there is no attempt to rank the winners as better or best. The judges select the entries which indicate an outstanding effort in behalf of safety."

High-vacuum valves, baffles and traps are detailed in 28-page bulletin including photographs, drawings and specification charts. Bul 10-1 — Consolidated Vacuum Corp., Subsidiary of Consolidated Electrodynamics/Bell & Howell.

Check 4962 opposite last page.

..How many tank cars do you lose yearly?

Unless you meter, how can you accurately translate your process losses into loss of profits.

For example, a chemical company making finished products had been carrying "process loss" as a routine accounting entry on their books. They were startled to find that the total of these apparently small losses reached almost 2½ tank cars a year. These were liquids lost or unaccounted for. Leaks, spillage, spoiled batches and perhaps lax plant security measures all were contributing factors.

A meter program, recommended by a Rockwell engineer substantially pinpointed these losses. The result? A marked increase in finished product and most important, *in profits!*

You can use these meters to save money, earn money, to catch leaks and so improve your plant housekeeping and operations. They are the *low cost* way to control liquid inventories and usage—to batch or blend accurately and to improve quality. Since Rockwell meters are made in the widest variety of types and metals (including stainless steel) you can use them to measure practically any liquid that can be piped.

Rockwell liquid meters are sold by jobbers everywhere and backed by our staff of field engineers. Use the handy coupon or write Rockwell Manufacturing Company, Pittsburgh 8, Pa. In Canada, Rockwell Manufacturing Company of Canada, Ltd., Box 420, Guelph, Ontario.

INDUSTRIAL METERS
another fine product by
ROCKWELL

CLIP COUPON MAIL TODAY

Rockwell Manufacturing Company
Dept. 131G, Pittsburgh 8, Pa.

Gentlemen:
Please have your field engineer call ( )

I am interested in measuring_____
(Name of Liquid)

Pipe size_____"

Working pressure_____psi Temperature_____°F max.

Max. flow rate_____gpm Min. flow rate_____gpm

Your Name_____

Company_____

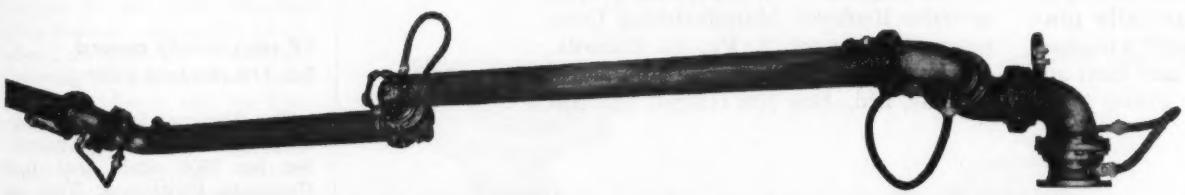
Street_____

City_____ Zone_____ State_____

Check 4961 opposite last page.

LOAD MOLTEN SULPHUR, ASPHALT IN LESS TIME AND GREATER SAFETY

CHIKSAN STEAM JACKETED JOINTS



AND JACKETED LOADING ARMS

Consider the advantages a Chiksan steam jacketed joint offers you. It is an effective long lasting product backed by over 10 years of proven-in-use service. It is available to you in a complete range of sizes from 2" thru 12" pipe size. It can be equipped with any one of a number of packing units tailoring the joint to your specific service. In addition to sulphur and asphalt, these joints and arms are equally adept at handling viscous oils, napthalene and heavy tars. There is another plus in the Chiksan steam jacketed joint—the many practical years of Chiksan know-how in designing installations. These recommendations teamed with Chiksan equipment are your assurance of a facility providing maximum flow-thru with greatest safety. For more specific details on steam jacketed joints and arms, write Chiksan.

CHIKSAN

#61-63

fmc

CHIKSAN COMPANY—General Offices: Brea, California • Well Equipment Mfg. Corp. Division (Weco Unions, Hamer Valves) • Chiksan International • Chiksan of Canada Ltd.
Offices and Representatives in Principal Cities of the World

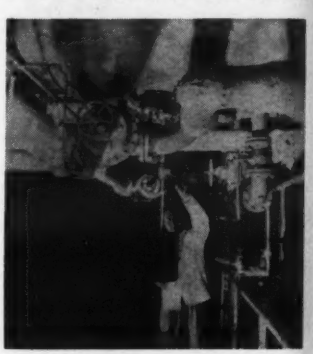
Check 4963 opposite last page.

▶ A NEW SOLUTIONS ARTICLE

Glass-lined pipe halts continuous-reaming need on epoxy-lined pipe

Replacing epoxy lined pipe with glass-lined metal variety at Goodyear Tire and Rubber Company's synthetic-latex plant in Akron, Ohio, has virtually eliminated need for continuous reaming to keep latex lines opened.

Appoximately 4000′ of glass-lined ranging in diameter from 3 to 6″ is now in use. Initial cost of pipe has been fully recovered by one yr of savings in maintenance.



Synthetic-latex sample is drawn off through glass-lined pipe at Goodyear Tire & Rubber Company's plant in Akron, Ohio

For long runs of pipe, installation crews simply threaded-on metal flanges onto ends of each length and bolt sections together using flat gasket. For closing pieces, pipe was cut in field with abrasive saw, and threaded in conventional manner.

Although field cutting results in some chipping of glass about ⅛″ back from pipe end, it does not present operational problem because no significant product build-up occurs.

Latex is slightly alkaline, so Goodyear engineers subjected glass-lined pipe to rigorous tests under conditions far more severe that would be normally encountered. The pipe performed satisfactorily in these tests.

(Green glass-lined pipe is product of Pfaudler Division, Pfaudler Permutit Inc., Rochester 3, N.Y.)

Check 4964 opposite last page.

THAT'S INTERESTING

Old roads enlivened

Older roads are being rehabilitated in Massachusetts by applying new surface of polymer-blended asphalt and aggregate.

Adding as little as 3% of the polymer, Naugapol 3112, in dry crumb form to hot asphalt, increases asphalt's viscosity and elasticity "markedly."

Tests indicate polymer-blended asphalt has greater resistance to stripping, bleeding, low-temp impact and rutting.

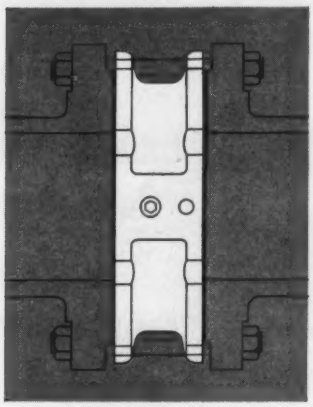
Massachusetts highway engineers, working with Naugatuck Chemical Division (U.S. Rubber) research group, developed technique.

Best shift isn't 8 hr

For around the clock operations, at least, 8 hr on duty and 8 hr off duty isn't necessarily most efficient means of accomplishing tasks, the Air Force concludes.

Best results in study were obtained with subjects working 2-hr and 4-hr cycles.

The Duo-Chek® is easily lowered into position between the flange faces; because of its light weight, special handling equipment is unnecessary. Fits standard valve flanges. In sizes 2 inch through 12 inch, one valve fits series 125, series 150 and series 300 flanges, saving inventory at less cost than a conventional 150 series. The machined outside diameter centers the Duo-Chek between series 300 flanges; the slots center it for series 150 flanges.



PAT. PENDING

MISSION DUO-CHEK NO SLAM CHECK VALVE

If your check valve problem is water hammer, Duo-Chek is the answer. If it's weight, maintenance, mounting position, or cost, Duo-Chek is still the right answer. The Duo-Chek performs all regular check valve duties, yet weighs only ten per cent as much.

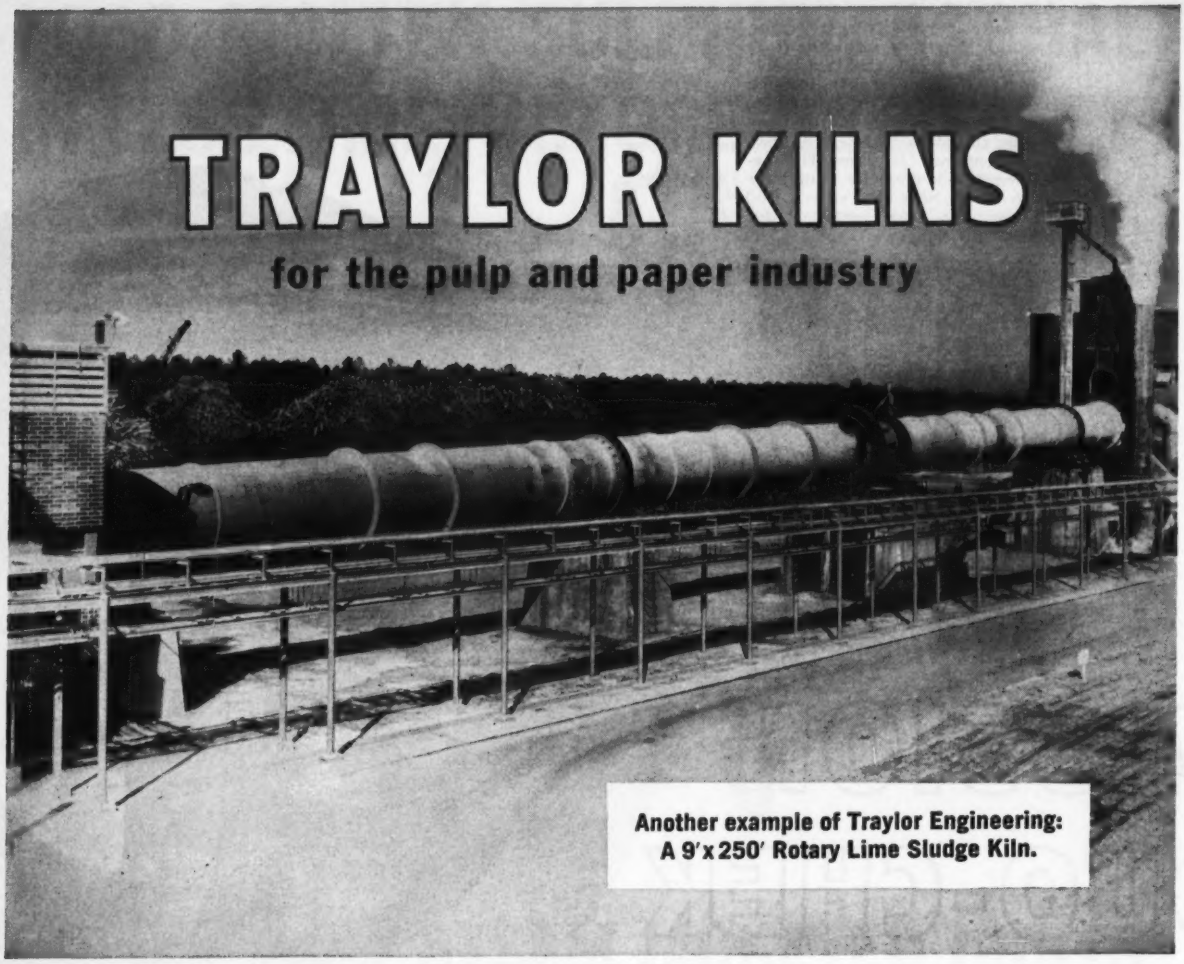
The spring loaded, light weight sealing plates operate in any position—even in vertical lines with downward flow. The stainless steel coil spring effects positive sealing action. The quick action of the spring closes the valve before reverse flow can occur; therefore, no slam, no water hammer.

Duo-Chek valves come in a complete range of end connections and sizes from 2 to 48 inches, for ASA pressure ratings of series 125 through 2500, and for temperatures to 1400°F. They are made in steel, stainless steel, aluminum, and bronze. Sealing materials are Buna-N, Teflon, Viton, or metal depending on your service.

MISSION VALVE AND PUMP CO. A SUBSIDIARY OF MISSION MANUFACTURING CO. P.O. Box 4209, Houston, Texas • Cable Address "MISSCO" Export Office: 30 Rockefeller Plaza, New York • In the United Kingdom: MISSION MANUFACTURING CO., LTD., 1 Hanover Square, London W. 1 England • Cable Address "MISSOMAN" • Sold by Mission Manufacturing Company outside of Canada and the U.S.A.

MISSION VALVE AND PUMP CO.

Check 4965 opposite last page.



Another example of Traylor Engineering:
A 9'x250' Rotary Lime Sludge Kiln.

One of the most important advantages of Traylor Lime Sludge Kilns in pulp mill operations is their money-saving efficiency in recovering lime for reuse over and over again. This, plus Traylor's unexcelled heat recovery systems and thorough, experienced attention to engineering details, produces kiln installations that are notable for continuous service.

Write for Bulletin TKB-3 on Heat Recovery Systems, or Bulletin No. 1115 on Traylor Kiln installations.

TRAYLOR ENGINEERING & MANUFACTURING
DIVISION OF FULLER COMPANY
1552 MILL STREET, ALLENTOWN, PA.
Sales Offices: New York—Chicago—San Francisco
Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P.Q.

Check 4966 opposite last page.

NEW LITERATURE
Plant Engineering, Safety and Fluids Handling

Breather valve offers choice of any one of three pallet designs—diaphragm, air-cushion or metal-to-metal. It converts by replacing pallets. Valve has quick-opening access covers. Materials used throughout valve are all corrosion resistant to atmosphere and hydrocarbon-product vapors and including aromatic hydrocarbons. Predominant metal is aluminum. Critical parts such as pallets, guide posts and seat rings are anodized. Other external body trim is stainless steel or cadmium-plated steel. Valves are further specified in Bul CP2701—The Vapor Recovery Systems Co.

Check 4967 opposite last page.

Process pumps in a recently developed line are shown in eight-page bulletin. Information illustrates how 72 basic combinations permit a choice of features for service required. Bul 1-210 — Byron Jackson Pumps, Inc.

Check 4968 opposite last page.

Combination plug-check valve is discussed in eight-page catalog. Called the "Plugaroo", device is actually two valves in one. It can be used in either vertical or horizontal position. Non-lubricated, the valve assures maximum security with minimum maintenance. Price Sheet PC-4 —Frank Wheatley Corporation.

Check 4969 opposite last page.

Gasoline - exhaust - fume exposure for fork-lift-truck-driver is subject of two-page report of operating test. Report 107—Oxy-Catalyst.

Check 4970 opposite last page.

Takeups, in seven frame styles and equipped with sleeve, ball or roller bearings, are expanded upon in 16-page Book 2741—Link-Belt Company.

Check 4971 opposite last page.

Welding and cutting definitions have been incorporated in a 60-page booklet published by the American Welding Society. In conjunction with this publication, a new master chart of welding processes has been prepared. It presents the 39 recognized welding processes. Chart is available in two sizes: 8½ x 11" for desk use and 22 x 28" for wall posting. Copies of "AWS Definitions—Welding and Cutting" (including Desk Chart) may be obtained at $2.00 per booklet, and copies of Wall and Desk Charts may be obtained separately for $1.50 and $0.50 each, respectively, from Dept. T, American Welding Society, Incorporated, 33 W. 39th St., New York 18, N.Y.

manufacturers' current literature

This section features a variety of literature currently available from manufacturers. See also the other sections in this issue for new literature pertaining to those particular sections

Process Instrumentation and Laboratory Apparatus

Self-priming rotary pump for carboy services, general-laboratory operations and pilot-plant work is offered in Hastelloy C with twin impellers and bearings in either Teflon or carbon. It is delineated in Cat HCT-161—Eco Engineering Company.

Check 4972 opposite last page.

Heating mantles, such as one in which heat input for each unit can be individually controlled, are specified in Heating Mantles Details—Glas-Col Apparatus Company.

Check 4973 opposite last page.

Differential-pressure transmitter has liquid-filled primary unit and diagonally split case. It is presented in Bul 98413—Taylor Instrument Companies.

Check 4974 opposite last page.

Jet-pump line has hydraulic-, air- or steam-operated models in variety of materials. Penberthy Manufacturing Company, Division of Buffalo-Eclipse Corporation.

Check 4975 opposite last page.

A metering pump that automatically corrects its pumping rate is the subject of 28-page data book. Cat 59—Process Equipment Division, Lapp Insulator Company, Inc.

Check 4976 opposite last page.

Dial-indicating thermometers for applications of −40 to +450°F have adjustable mounting brackets permitting cases to tilt 60° forward or 90° backwards, plus rotate 90° angular in either direction. They are covered in Product Data Sheet 2—Industrial Instrument Division, Electric Autolite Co.

Check 4977 opposite last page.

Rotameters have deeply overlapping capacities and integrated tube-float combinations. They are available in sizes of ⅜ through 3″ with 5 and 10″ scales. Information on Varea-meters is available from Dept. V-5.22, Wallace & Tiernan Inc.

Check 4978 opposite last page.

Thermocouple-extension-wire line, including metal sheathed-ceramic insulated wire and cable with 6 to 56 pairs of matched conductors in one cable, are delineated in more than 18 pages of information in Cat W-5—Thermo Electric Co., Inc.

Check 4979 opposite last page.

Needle valves of various types, including alloy-steel series for working pressures to 10,000 psi, are taken up in Needle Valves Buls—Marsh Instrument Company, Division of Colorado Oil and Gas Corporation.

Check 4980 opposite last page.

Proportioning-pump capacities are in range of 1 to 812 gph (simplex) and 2 to 1624 gph (duplex). Maximum working pressure is 10,000 psi for pumps which are covered in Proportioning Pumps 300 Details—Pump Division, American Meter Company Inc.

Check 4981 opposite last page.

Liquid-level controls provide floatless means of controlling any conductive liquid or moist bulk material having resistivity of up to 12.5 megohms. These and other units are subject of technical data available from The B/W Controller Corporation.

Check 4982 opposite last page.

Miniature three-pen recorder incorporates DC input isolation and noise-free DC output signals. It is subject of information put out by Devar Systems Inc., Division of General Kinetics Corporation.

Check 4983 opposite last page.

Solenoid valves capable of handling temperatures to 400°F in sizes of ⅜ to 3″ are tabulated in Bul V—The Johnson Corporation.

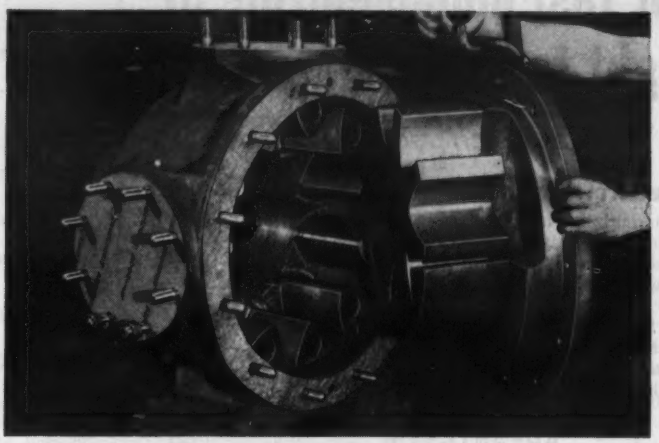
Check 4984 opposite last page.

Material Handling

Tractor-shovel model combines 2,500-lb capacity with complete power-shift transmission, power steering, six-ft turning radius and power-transfer differential. It is covered in booklet, "Industrial Material Handling From A to Z" —The Frank G. Hough Company, Subsidiary of International Harvester Company.

Check 4985 opposite last page.

GEARED TO HANDLE PUMPING PROBLEMS

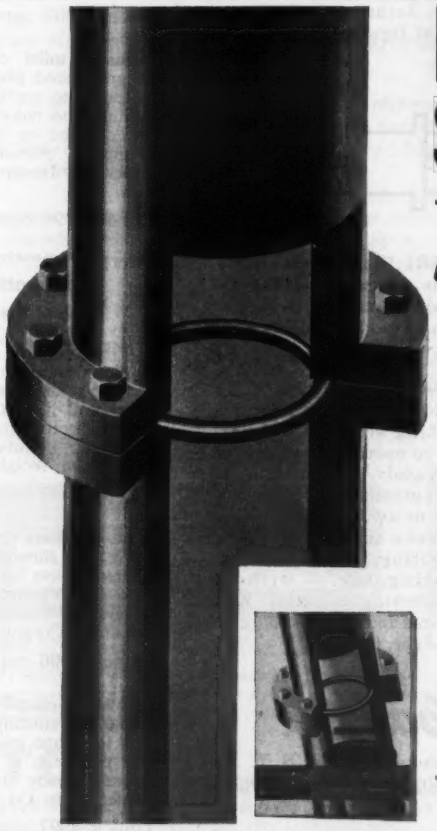


THE VIKING "GEAR-WITHIN-A-GEAR" PUMPING PRINCIPLE helps engineers solve a wide range of pumping problems throughout the world. In the petroleum industry, chemical processing, food processing, meat packing, road building and many other industries, **VIKING PUMPS** handle liquids and semi-solids efficiently and at low cost. And **VIKINGS** pump liquids ranging from thin, liquefied gas to thick, viscous tars. Originated 50 years ago, the **VIKING** pumping principle has been adapted so successfully to so many applications that **VIKING** is now the largest exclusive rotary pump manufacturer in the world.

You men who specify and buy rotary pumps, can select from a complete size range of **VIKING PUMPS,** from ½ to 1050 G.P.M. in over 850 catalogued models and thousands of special designs. If you have a pumping problem, tell us . . . and ask for catalog 61SCC.

VIKING PUMP COMPANY, Cedar Falls, Iowa, U.S.A. In Canada, it's **"Roto-King"** Pumps. See our unit in Chemical Engineering Catalog.

Check 4986 opposite last page.



POSITIVE SEALS

−452° to 3000° F.

United Self-Energized Metallic O-Rings**...

form permanent, non-corrosive, static seals under temperature extremes from −452° to 3000° F. and pressures from 10^{-6} mm Hg to 100,000 psi. Available in various metals and coatings (including Teflon** and silver) ¼″ O.D. dia. to any size and configuration. United also makes non-vented and pressure-filled O-rings. **United Metallic "O" Rings, manufactured by United Aircraft Products, Inc., Box 1035, Dayton, Ohio.**

See United Metallic O-Ring Catalog in Sweet's Product Design File or write for Free Handbook

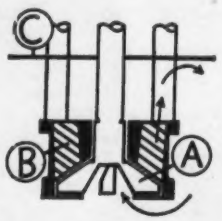
*Patents 2,809,269; 2,837,360
**DuPont registered trademark

Check 4987 opposite last page.

For fast homogenizing of light to heavy materials

Eppenbach Homo-Mixers

OPERATING PRINCIPLE: Homogenizing head is immersed to bottom of mixing vessel. High-speed turbine (A) draws product upward, shears it in the fine clearance between turbine and stator and forces it upward through restricted openings in stator (B). Adjustable baffle (C) deflects flow to sides and down into mixing area.

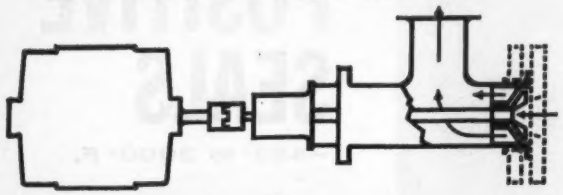


ADVANTAGES: Fast, complete breakdown through intense impact and hydraulic shear. Rapid downflow wets floating material. Absence of vortex results in *minimum entrapment of air*. Hardened steel turbine and stator hold clearance tolerances for uniform results. Easy to clean by operating in solvent or soap solution.

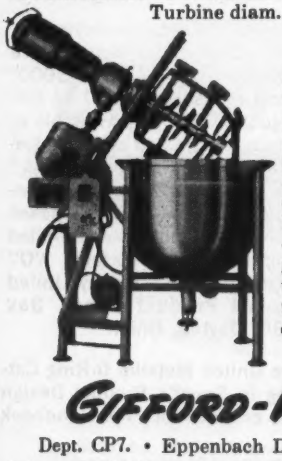
LAB, PILOT AND PRODUCTION MODELS. Typical sizes:

Model	hp	rpm	Turb diam	gal/hr*
1-L	¼	8000	1.719"	¼-2
1-HU	1½	7200	1.937"	5-40
2½-H	3	3500	3.562"	to 75
3-H	5	3500	3.812"	to 100
5-H	10	3500	4.938"	to 500
7-H	20	3500	5.625"	to 1000

*for comparison only. Actual output ranges from 50% to 200% of figures given.



NEW! PIPELINE HOMO-MIXER: For air-free, continuous homogenizing. Also acts as pump. Material may be recirculated or a number of units connected in series. Turbine diam. from 2" to giant 10" models.



AGI-MIXER: Homo-Mixer head combined with contra-rotating scraper paddles. Can be operated together or separately. Jacketed kettle and automatic temperature controls available. Versatile, handles a series of processes — melting, stirring, homogenizing, etc. — without transferring material. Kettle sizes from 3 to 1000 gals or larger.

GIFFORD-WOOD CO.

Dept. CP7. • Eppenbach Division • Hudson, N.Y.

Ask about Gifford-Wood Time Sales and Leasing Plans

Check 4988 opposite last page.

CURRENT LITERATURE

Feeder combines vibrating hopper, feeder and controls in single package. Incorporating permanent-magnetic dual-vibratory action, it is covered in Volumatic Feeder Bul —Eriez Manufacturing Co.

Check 4989 opposite last page.

Two models of lift trucks with pneumatic tires, each of which may be equipped with gasoline, LP-gas or diesel engine, are described in Bul BU-604—Engine-Material Handling Division, Allis-Chalmers.

Check 4990 opposite last page.

Dial scales are available in three platform sizes—18 x 20", 21 x 29" and 30 x 30". Additional information is available from—Scale Division, Fairbanks, Morse & Co.

Check 4991 opposite last page.

Live-bin vibrating feeder has accuracy of better than 1% minute-to-minute on most materials. It is expanded upon in "Vibra Screw Live Bin Feeders"—Vibra Screw Feeders, Inc.

Check 4992 opposite last page.

Conveyor-belt cleaners are adjustable to fit any size conveyor. Specifications are contained in Bul 258—Standard Products Division, Stephens-Adamson Mfg. Co.

Check 4993 opposite last page.

Transfer units convey pelletized or granulated plastics and similar materials to provide self-contained loading and unloading units. They are detailed in Bul A-23—Fuller Company, Subsidiary of General American Transporation Corporation.

Check 4994 opposite last page.

Separation and Size Reduction

Cyclone collector has all-steel construction and nine-inch-diam cast tubes and fittings. Information on the collector may be obtained from Air Pollution Control Division, John Wood Company.

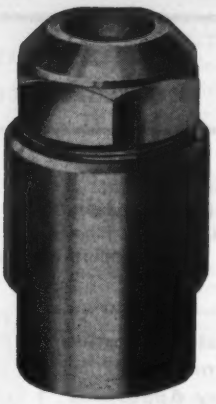
Check 4995 opposite last page.

Gas scrubbers designed to permit recycle of slurries with high solids contents have no nozzles, trays or jets. S-F Venturi Scrubbers—Gas Scrubber Division, Chemical Construction Corporation.

Check 4996 opposite last page.

Pulverizer-classifier, which is capable of reducing dry material to less than one micron and classifying precisely, is subject of information made available by The Bauer Bros. Co.

Check 4997 opposite last page.



DELAVAN CARBIDE SPRAY DRYING NOZZLES LAST LONGER

Tungsten carbide orifice plus patented swirl chamber combine to give you a longer lasting, better performing nozzle. Flow rates and spray angles are certified — your assurance of performance as rated. For full facts on the Delavan SDX (illustrated) and others, write for Catalog SD-1 and SD-2.

DELAVAN Manufacturing Company
WEST DES MOINES, IOWA

Check 4998 opposite last page.

TRY DARCOVA PUMCUPS FOR

- *Higher pump efficiency*
- *Lower pump maintenance*

Cross-section of the conventional and 45° bevel type Pumcups

IT'S a fact that hundreds of reciprocating pump and cylinder users today are standardizing on Darcova Pumcups because they eliminate fluid slippage, costly down-time and maintenance!

It's easy to check these claims right in your own plant. Behind this exceptional Darcova Pumcup performance lies texture-engineering and cup design that conform precisely to pressure-temperature-fluid conditions.

Pumcups of various types are available in a complete range of sizes and texture-engineered compositions for your reciprocating pump and cylinder requirements.

Pumcups are available in 100% Nylon as well as other texture-engineered compositions. Write for your copy of Bulletin No. 5903.

DARLING VALVE & MANUFACTURING CO.
Williamsport 4, Pa.

DARCOVA TRADE MARK PUMCUPS

Check 4999 opposite last page.

Lever-type pulverizer crushes materials from ¼" to dust in single operation. It is expanded upon in Reliance Crusher Bul—Universal Road Machinery Co.

Check 5000 opposite last page.

Grinder-classifiers each incorporate twin action in single chamber to provide fines in range of ½ to 44 microns. Full details are available from Sturtevant Mill Co.

Check 5001 opposite last page.

Felt filter media with degree of filtration down to ½ micron operates in temperature range of −50 to +300°F. It is covered in Felt Literature — Industrial Products Division, Troy Mills, Inc.

Check 5002 opposite last page.

Tramp-iron and fine-ferrous contamination can be protected against by use of permanent plate magnets detailed in Erium Bul—Eriez Manufacturing Co.

Check 5003 opposite last page.

Drying and Heating

Heat-transfer equipment, including evaporators, vacuum rotary dryers, drum dryers, heat exchangers and flakers, are tabulated in Heat-transfer Equipment Bul—Goslin-Birmingham Manufacturing Co., Inc.

Check 5004 opposite last page.

Dryers and heaters of indirect-fired type are specified in Bul AH-438-11—Hardinge Company, Incorporated.

Check 5005 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Scraped-surface exchangers for heat-transfer and crystallization application incorporate continuous rotating-scraper action. Literature is available from Henry Vogt Machine Co.

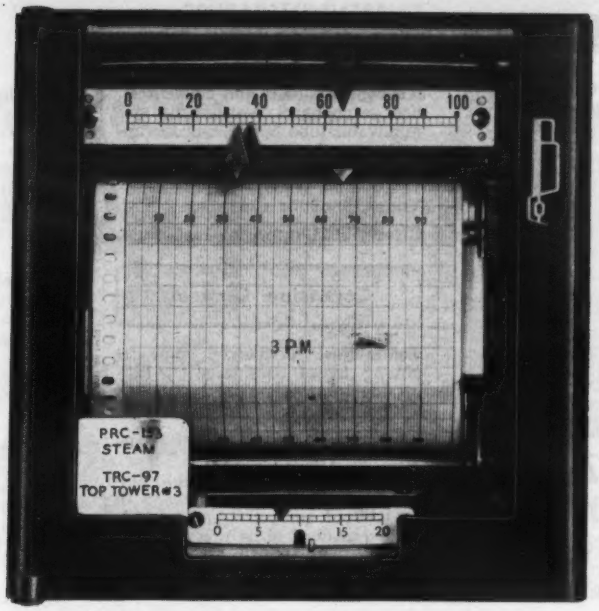
Check 5006 opposite last page.

Heating mantles for every use are considered in a bulletin made available by Dept. CP, Glas-Col Apparatus Company.

Check 5007 opposite last page.

Heat-exchange panel of coil type can be operated at pressures to 250 psig. It is presented in Bul P54—Platecoil Division, Tranter Manufacturing, Inc.

Check 5008 opposite last page.



New Bristol Series 670 Metagraphic receivers measure only 7" wide by 7⅛" high on panel, come in a wide selection of models, including 1-, 2-, and 3-pen models and models with manual-automatic, manual-cascade, and manual-automatic-cascade control stations.

Now: the USER-PLANNED Receiver

New Bristol Metagraphic offers you more features for easy installation, flawless operation, and fast, no-down-time servicing than any other 4-inch-chart pneumatic receiver.

At last, here's the ideal pneumatic receiver for graphic panel applications.

It's Bristol's new Series 670 Metagraphic, the receiver with complete plug-in versatility and convenience, plus these new user-designed features:

Simplified control switching between functions—Allows the easiest start-up procedures for automatic or cascade operation. Just adjust process to line up color-coded indicators and switch to automatic or cascade operation as desired.

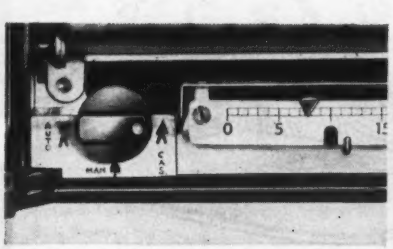
Uniform control switching—All receiver models have the same convenient, easy-to-remember switch positions for the various types of control: cascade position; 3 o'clock; manual position, 6 o'clock; and automatic position, 9 o'clock.

Simplified chart change and inking—Chart changing is a one-hand operation. A new chart can be slipped into place in an instant. The capillary inking system can be filled from the front of the receiver.

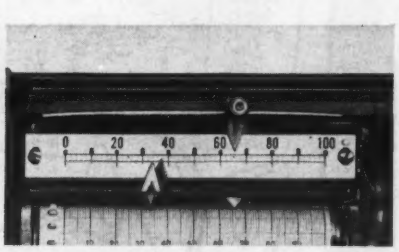
And that's not all: Series 670 gives you such outstanding features as rectilinear chart coordinates for easiest reading, easy connections for any type of control, and sparkless mercury-switch disconnect of electrical circuit when plug-in chassis is withdrawn.

Write for complete data on the new Series 670 today. The Bristol Company, 141 Bristol Road, Waterbury 20, Conn., a Subsidiary of American Chain & Cable Company, Inc. 0.43

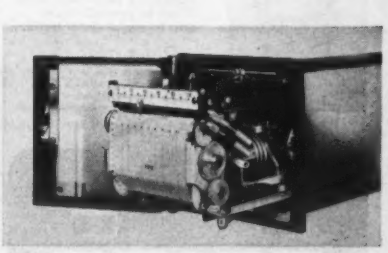
ACCO



Simplified, uniformly-planned control switching facilitates process start-up and operator training.



Brightly-colored distinctively-shaped pointers signal process deviation from set-point, even at a distance.



Complete plug-in versatility—long a Metagraphic feature—insures continuity of service.

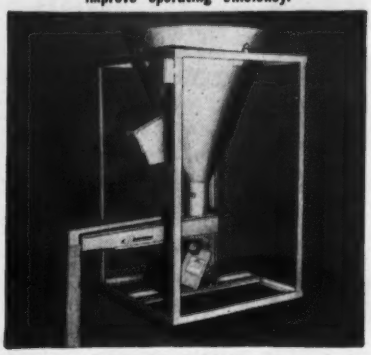
BRISTOL...for improved production through measurement and control

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Check 5009 opposite last page.

ERIEZ *Magnetic Minute*

60 seconds that will help you improve operating efficiency.



NEW FROM ERIEZ . . . VOLUMATIC FEEDER MACHINE combines vibrating hopper, feeder, and controls in a single compact package

Your packaging, weighing, bagging, and mixing operations will be improved four ways with this new Eriez Hi-Vi® Volumatic Feeder Machine.

Check these cost-cutting features:

ACCURATE . . . cuts out waste, saves you money by precision handling of most any dry bulk material.

DEPENDABLE . . . Exclusive Hi-Vi permanent-magnetic dual vibratory action assures uniform flow of dry materials; eliminates troublesome rear-end dead spots, front-end flip. Totally-enclosed drive unit means trouble-free operation.

VERSATILE . . . moisture and dust resistant enclosed units can be safely installed anywhere! Three popularly sized models provide unlimited range of feed rates from a trickle of a few ounces to 10 tons per hour. Built-in intermittent feed feature optional. All models are available in designs for hazardous, dusty locations.

ECONOMICAL . . . variable transformer AC controls means you need no rectifiers, exclusive fibre glass springs cut maintenance costs and offer more positive control.

For **FREE** descriptive bulletin write . . .

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R. W. SHIVELY
Product Manager
Vibratory Division

ERIEZ

A GROWTH COMPANY . . .
10 NEW PRODUCTS IN THE LAST 5 YEARS

Check 5010 opposite last page.

CURRENT LITERATURE

Air-cooled coolers and condensers, heat exchangers with fixed- and removable-tube bundles, and evaporative coolers and condensers are reviewed in Cats 557, 1261 and 1160, and 1959, respectively—Young Radiator Company.

Check 5011 opposite last page.

Corrosion Control

Teflon-lined preflanged pipe is among topics considered in Fluoroflex Information — Resistoflex Corporation.

Check 5012 opposite last page.

Teflon-yarn packing of multi-filament construction is available with or without surface lubrication. A wide range of sizes are available from ⅛" up. Packing is reviewed in Buls P-321 and P-325—Crane Packing Co.

Check 5013 opposite last page.

Glassed-steel reactors and glassed steel alone are covered in Buls 988 and 985, respectively—Dept. CW-71, Pfaudler Division, Pfaudler Permutit Inc.

Check 5014 opposite last page.

Vinyl coating designed specifically for airless spraying is considered in Tech Data Sheet AV—Coatings and Linings Division, U.S. Stoneware.

Check 5014 opposite last page.

Saran-lined pipe, suitable for corrosive acids and processing chemicals in systems operating from vacuum to 300 psi and from below zero to 200° F, are detailed in information available from Saran Lined Pipe Company.

Check 5015 opposite last page.

Thin-wall pipe fittings of stainless steel, aluminum and special alloys can meet many critical process-line requirements. Speedline Pipe Fittings—Horace T. Potts Company.

Check 5016 opposite last page.

The roles of tantalum, titanium and zirconium in solving corrosion problems are taken up in Bul 978—Dept. CW-71, Pfaudler Division, Pfaudler Permutit Inc.

Check 5017 opposite last page.

Corrosion-resistant valves are available in variety of materials for pressures to 2500 psi and temperatures to 1000°F. Corrosion-resistant valves—The Wm. Powell Company.

Check 5018 opposite last page.

Sealless plastic pumps have capacities to 40 gpm and are available in 54 combinations of materials. For complete specifications see Cat 10—Vanton Pump and Equipment Corp., Division of Cooper Alloy Corporation.

Check 5019 opposite last page.

". . . Under separate cover we are sending Mr. Flibbert, our factory expert. . ."

ERIEZ *Magnetic Minute*

60 seconds that will help you improve operating efficiency.

Protect Your MACHINERY, PRODUCTION, and REPUTATION AGAINST DANGEROUS TRAMP IRON

Get positive protection against costly, damaging tramp iron and fine ferrous contamination with Erium® Powered Permanent Plate Magnets. Here are a few of the many reasons why Eriez Magnetic Separators are your best buy:

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- FLEXIBLE: Uniform installation dimensions makes all models and strengths interchangeable.

Take advantage of the most versatile line available. Get the model with the Erium® power source that meets your exact needs. Full data in our new bulletin. Write to:

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MAGNA-THOUGHT
The goodwill a company enjoys rests, in the final analysis, on the intrinsic quality of its products.

E. C. Miller

E. C. MILLER
Executive Vice President

ERIEZ

A GROWTH COMPANY . . .
10 NEW PRODUCTS IN THE LAST 5 YEARS

Check 5020 opposite last page.

Corrosion-resistant-coatings specifications and descriptions are charted in four-page Bul 259—Wisconsin Protective Coating Corp.

Check 5021 opposite last page.

Valves

Ball valves are illustrated and specified in 72-page catalog including seven-page chart guide to corrosion-resistant materials correct for various reagents. Cat BV-60—Pacific Valves, Inc.

Check 5022 opposite last page.

Ball-valve design incorporates floating-ball principle which gives effective seal and compensates for variation in shrinkage rates between constructional and seating materials. Valves are reviewed in Ball Valves Literature—Jamesbury Corp.

Check 5023 opposite last page.

Ram-type drain valves with a flush-bottom feature that prevents clogging are described in full Drain Valves Cat—Strahman Valves Inc.

Check 5024 opposite last page.

Ball valve for operation in water, oil and gas service is rated for 300 psi at 250°F with Buna-N seats and 300 psi at 450°F with Teflon seats. Available in sizes of ¼ to 2″, valves are expanded upon in Folder DH-38A—R-P&C Valve Division, American Chain & Cable Company, Inc.

Check 5025 opposite last page.

Shut-off valve operates at pressures to 10,000 psi and has stem packing which is replaceable under pressure. Available in sizes of ¼ through ¾″, it is taken up in Petro Shut-off Valve Literature—Clayton Mark & Company .

Check 5026 opposite last page.

Fluids Handling

Spray-nozzle accessories are handled in three bulletins: split-eyelet connectors for pressures to 250 psi, adjustable joints in sizes of ¼ to 2½″, and line strainers designed for pressures up to 5000 psi in ¼ to 6″ pipe size are described in Buls 93, 97 and 94, respectively. Spray-nozzle information is also contained in Cat 24—Spraying Systems Co.

Check 5027 opposite last page.

Pipe-fabrication standards, on such subjects as testing, welding, stress-relieving practices, and the like, are considered in 13 Pipe Fabrication Standards—Pipe Fabrication Institute.

Check 5028 opposite last page.

DAY-TO-DAY VERSATILITY . . .
LONG-RANGE FLEXIBILITY!

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You buy a Sperry Filter Press for a specific application. Then you find yourself improving your product — making process changes — adding new products — saving vital production dollars and increasing income.

Sperry stimulates progress of this sort because its plate and frame construction does not limit your production capabilities. A Sperry press can be used for a multitude of applications — go from one chamber to full capacity; handle most filterable mixtures using most media, even paper alone; and easily change products as required by your production schedule.

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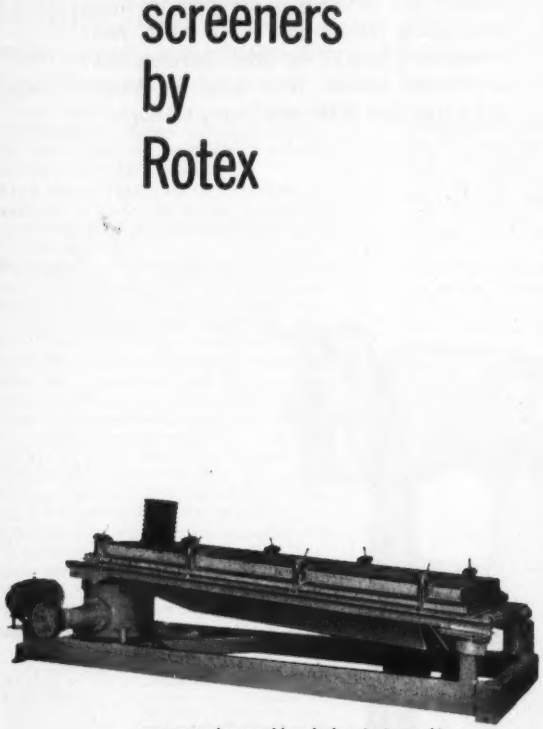
Check 5029 opposite last page.

APPROVED

new sanitary screeners by Rotex



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constant screen tensioning and fast screen changes
high production capacity . . . no screen blinding
unexcelled workmanship . . . rugged construction
wide range of models for small or large capacities

write or call . . . our experienced engineers will be pleased to cooperate with you

ROTEX®

THE ORVILLE SIMPSON CO., CINCINNATI 23, OHIO

Check 5030 opposite last page.

CURRENT LITERATURE

Impulse steam trap of 2½" size is installed on suction heater connected with 86,000-bbl tank containing fuel oil at storage terminal. At operating pressure of 100 psi, trap's capacity is 62,000 lb/hr. This model and others are specified in Bul T-1743—Yarnall-Waring Company.

Check 5031 opposite last page.

Pipe fittings of all types are topic of information published by Victaulic Company of America.

Check 5032 opposite last page.

Mechanical seals for heavy duty applications are itemized in Buls CP-551 and 575—Chemical & Power Products, Inc.

Check 5033 opposite last page.

Tube fittings can be made of any machineable metal or plastic. Swagelok tube fittings—Crawford Fitting Company.

Check 5034 opposite last page.

Teflon-jacketed gaskets are butt-welded. They are delineated in Cat AD-154—Garlock Inc.

Check 5035 opposite last page.

Gasket descriptions and specifications are outlined in three bulletins. Ring gaskets, heat-exchanger gaskets and corrugated-metal gaskets are presented in Buls 563, 564, and 565, respectively—Chicago-Wilcox Mfg. Co.

Check 5036 opposite last page.

Quick-connect valved couplings can handle over 600 different fluids through correct choice of packers and seals. Full story is contained in Packer Usage Guide —Snap-Tite Inc.

Check 5037 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Steam-trap selection, installation and maintenance are among topics covered in 44-page Steam Trap Book—Armstrong Machine Works.

Check 5038 opposite last page.

Pump cups, constructed of 100% nylon as well as other compositions, are presented in Bul 5903—Darling Valve & Manufacturing Co.

Check 5039 opposite last page.

Carbide spray nozzles with tungsten-carbide orifices plus patented swirl chambers are taken up in Cats SD-1 and SD-2—Delavan Manufacturing Company.

Check 5040 opposite last page.

Von Arx Air Gun
NEW METHOD FOR
DE RUSTING
DE SCALING
CLEANING

REMOVES WELD SLAG OLD PAINT RUST

PNEUMATICALLY OPERATED

Eliminate weld slag, rust, old paint, clean concrete and rake joints fast and effectively with the VON ARX AIR GUN.

LARGER MODELS AVAILABLE

The VON ARX AIR GUN contains a series of hardened steel needles which adjust to the contour of the surface being cleaned.

Available in four sizes, there is a VON ARX AIR GUN to fit every job, large or small. For further information or demonstrations, write or call . . .

EASILY CLEANS HARD-TO-GET-AT AREAS

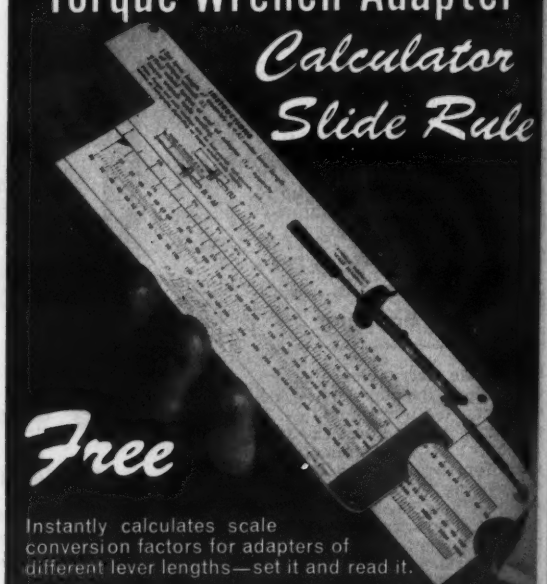
C. J. BREITENSTEIN CO.

8805-5 SHERIDAN DR. BUFFALO 21, N. Y. NF 2-8375

Western States: T. G. CULLEN, 3710 Grand Ave., Dept. 60, Oakland, Calif.

Check 5041 opposite last page.

Torque Wrench Adapter
Calculator
Slide Rule



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Instantly calculates scale conversion factors for adapters of different lever lengths—set it and read it.

Provides automatic selection of proper torque wrench for adapters and/or proper adapters to go with given torque wrenches.

Sent free upon request compliments of

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ADDISON QUALITY ILLINOIS

Check 5042 opposite last page.

Joint sealer holds LP, gasoline, oils, gases, petrochemicals and refrigerants. Leak Lock—Highside Chemicals Incorporated.

Check 5043 opposite last page.

Pumps

Vacuum pumps have automatic-lubrication feature and capacities of 4.3 to 225 cu-ft/min. They are covered in Pumps and Compressors Cat—Lammert & Mann Co., Inc.

Check 5044 opposite last page.

Progressing-cavity pumps handle watery slurries or suspended solids up to 1-⅛" in diameter. Available in capacities to 500 gpm for pressures to 1000 psi, they are tabulated in Bul 100-CP—Robbins & Myers, Inc.

Check 5045 opposite last page.

Liquid-level gage sets incorporate floating shanks compensating for up to ⅜" variation from nominal center-to-center dimension. Liquid-level gage sets—Penberthy Manufacturing Company, Division of Buffalo-Eclipse Corporation.

Check 5046 opposite last page.

Chemical Materials

Information on sodium sulfide, sodium sulfhydrate and sodium chlorate is available, along with data sheet and Bul 328-B covering thionyl chloride, from Hooker Chemical Corporation.

Check 5047 opposite last page.

Vinyl-acrylic copolymer latex is self-reactive. Properties and applications are outlined in X-Link 2833 Tech Information—National Starch and Chemical Corp.

Check 5048 opposite last page.

Trimethylolpropane is now available at 30.5¢/lb. Additional information on trimethylolpropane and its applications may be obtained from Celanese Chemical Company, Division of Celanese Corporation of America.

Check 5049 opposite last page.

Silicas, tamart, red oxides and other mineral-products specifications are put out by Tamms Industries Co.

Check 5050 opposite last page.

Carbon dioxide is available on round-the-clock basis. Its economical use is discussed in Carbon Dioxide Use Booklet—Chemicals Division, Olin Mathieson.

Check 5051 opposite last page.

RAYMOND

Flash Drying

with fine disintegration of material

IN making certain types of powdered products which involve a drying operation, but no pulverizing, the Raymond Cage Mill Flash Drying System gives definite advantages in handling the job.

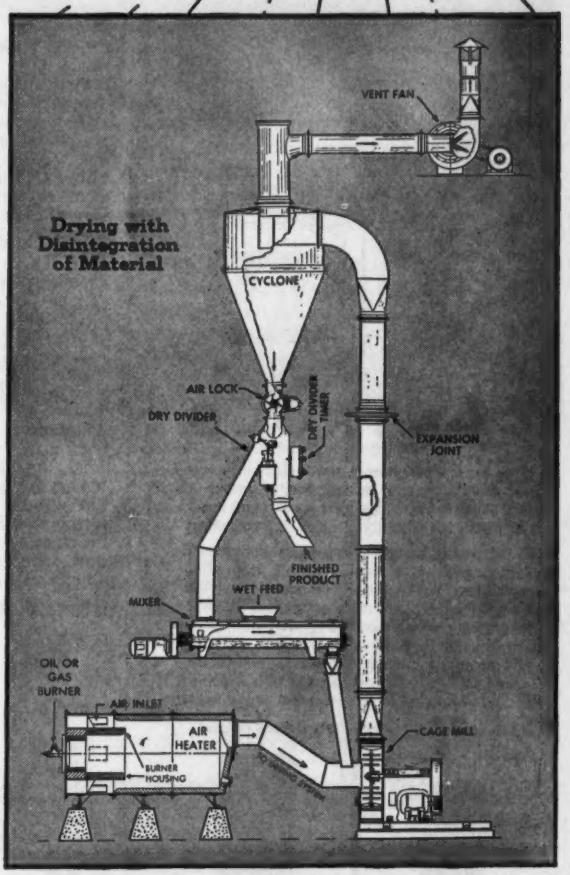
The Cage Mill disintegrates the material to normal particle size and simultaneously reduces the moisture to a specified final content, delivering a fluffy, free-flowing finished material.

Drying is instantaneous, and the small amount of fine material in the system at a time insures close control of the final moisture. This is important in handling heat-sensitive products.

High thermal efficiency plus clean, safe, dust-free, automatic operation are factors that simplify the process and add to the economy of the whole operation.

The system is flexible in application and, where pulverizing is necessary, the Raymond Imp Mill may be used in place of the Cage Mill.

Write for further details and tell us your requirements.



This flow sheet shows a typical set-up for the Raymond Flash Drying System. The Mixer unit is used for adding a portion of the dried material to the wet feed . . . to disperse the moisture and permit efficient drying of the product. For processing treated clays, corn gluten meal, filter cake and similar materials.

COMBUSTION ENGINEERING, INC.

Raymond Division

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Combustion Engineering-Superheater Ltd., Montreal, Canada

Check 5052 opposite last page.

Versatile new electronic relays
END PRODUCT CONTAMINATION
on level control applications!

B|W

Electronic Liquid Level
CONTROLS

Now—two new performance-proved electronic relays that provide accurate, reliable, floatless means of controlling any conductive liquid or moist bulk material having a resistivity of up to 12.5 megohms!

☐ Outstanding features and characteristics include: Positive means of adjusting sensitivity for specific applications. Very low electrode potential and low electrode current. No shock or sparking hazards. No product contamination due to electrolysis. Quick and easy conversion for direct or inverse operation. And, because both relays will operate several miles away from the level sensing electrodes, they permit accurate control of liquids from remote locations.

Other reliable B/W Floatless Liquid Level Control Equipment

Induction Type Relays | Automatic Alternators
Signals and Alarms | Electrodes and Holders

Complete technical data available upon request—write today!

THE B|W CONTROLLER CORPORATION
2200 E. MAPLE ROAD • BIRMINGHAM, MICHIGAN
Manufacturers of Liquid Level and Industrial Motor Controls

Check 5053 opposite last page.

CURRENT LITERATURE

Methanol and its properties are covered in Product Bul S-03-6—Celanese Chemical Company, Division of Celanese Corporation of America.

Check 5054 opposite last page.

Silicone-defoamer applications are reported in Foam Control Manual—from Dow Corning Corporation.

Check 5055 opposite last page.

Processing Equipment

Process-equipment line includes rotary kilns and slakers, ball and compartment mills, coolers and dryers, jaw and gyratory crushers, and slurry and table feeders. Process equipment—Traylor Engineering & Manufacturing, Division of Fuller Company, Subsidiary of General American Transportation Corporation.

Check 5056 opposite last page.

Chemical and petrochemical plants can be site-erected and packaged-produced. Girdler Corporation, Subsidiary of Chemical & Industrial Corp.

Check 5057 opposite last page.

Ammonium-nitrate plants, utilizing prill towers approximately 1/3 the size of conventional towers for production of ammonium-nitrate fertilizer and other nitrogen solutions, are subject of brochure containing data and flow sheets published by—The Chemical and Industrial Corp.

Check 5058 opposite last page.

Anti-corrosive wire-cloth applications and materials are subject of Bul F-C—Newark Wire Cloth Company.

Check 5059 opposite last page.

Ultra deionizer for automatically delivering, multi-column deionizer built in all anion and cation exchanger combinations, and small mixed-bed deionizer with exchangeable refill eliminating regeneration, are expanded upon in Buls 512A, H4 and 513—Elgin Softener Corporation.

Check 5060 opposite last page.

Blenders, which evenly distribute liquids evenly throughout each batch of dry material, are specified in Cat C-1—Paul O. Abbé Inc.

Check 5061 opposite last page.

Cryogenics' role in chemical-processing systems is considered in Cryogenics Information—Cryogenics Processing Division, Cherry-Burrell Corporation.

Check 5062 opposite last page.

Packed-tower data reflecting results obtained from research into mechanics of packed-tower operations are compiled in Packed Towers Engineering Manual—U.S. Stoneware.

Check 5063 opposite last page.

Elimination of secondary processing by full utilization of mixing properties is considered in Handbook on Mulling—Simpson Mix-Muller Division, National Engineering Company.

Check 5064 opposite last page.

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Pumping liquids from tank car into NEST-A-BIN, for direct delivery to consignee.

Check 5065 opposite last page.

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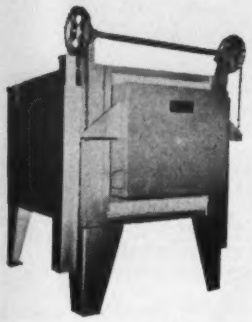

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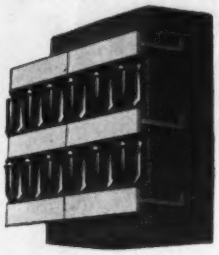

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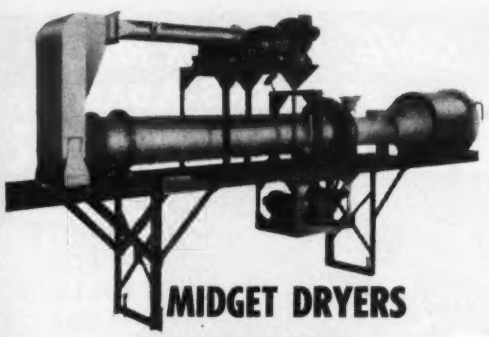

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Check 5067 opposite last page.

CURRENT LITERATURE

Mixers, for handling both dry and semi-wet materials, are subject of Marion Mixers Literature—Rapids Machinery Company.

Check 5068 opposite last page.

Oxygen-nitrogen plants of packaged type are available to produce either liquid or high-pressure gases. Oxygen-nitrogen plants—Independent Engineering Co., Inc.

Check 5069 opposite last page.

Fiberglass-trays for drying are described in catalog sheets available from Molded Fiber Glass Tray Co.

Check 5070 opposite last page.

Packaging

Flexible multi-wall sack utilizes a seamless polyethylene tube integrated with the multiwall. Details on MPS Multiwall Sacks may be obtained from Raymond Bag Corporation, Division of Albermarle Paper Mfg. Co.

Check 5071 opposite last page.

Grabbing tab and pulling opens multi-wall bag quickly. Pulling tab, attached to thread sewing bag shut, leaves bag itself intact. Complete information on multi-wall bags is published by Bemis Bro. Bag Co.

Check 5072 opposite last page.

Compressed-gas cylinders are specified in literature available from Pressed Steel Tank Company.

Check 5073 opposite last page.

Plant Engineering & Safety

PVC-coated gloves and PVC protective clothing are covered in Protective Clothing Literature—Jomac, Inc.

Check 5074 opposite last page.

Flashing compounds and joint sealers of various types are tabulated in four-page chart giving descriptions and specifications. Flashing-sealing Reference Chart—Benjamin Foster Company, Division of Amchem Products Inc.

Check 5075 opposite last page.

Anti-seize compounds give protection even after high-pressure high-temperature use to 1800°F. Fel-Pro C5-A—Felt Products Mfg. Co.

Check 5076 opposite last page.

For more information on developments in the section, check the Reader Service Slip.

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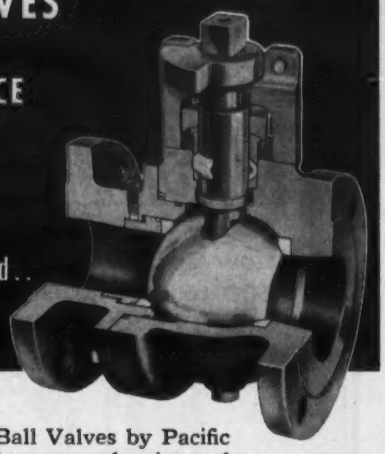

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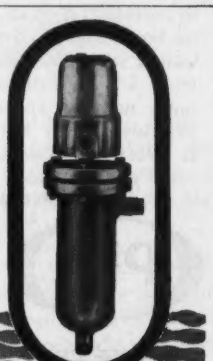

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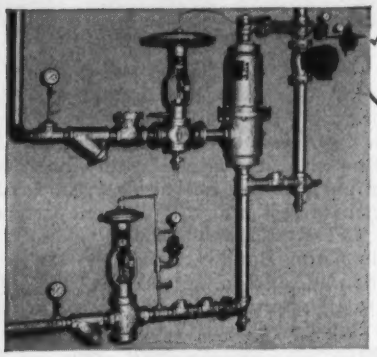

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Check 5079 opposite last page.

CURRENT LITERATURE

Mastics, including a breathing asphalt weather coat applied to insulation on heated equipment to permit moisture vapors to escape from hot surfaces without blistering coating, are explained in four-page Mastics Bul—Benjamin Foster Company, Division of Amchem Products Inc.

Check 5080 opposite last page.

Woven wire cloth is available in thousands of types—The W. S. Tyler Company.

Check 5081 opposite last page.

Surface coatings and sealers are tabulated in four-page summary of descriptions and specifications. Coatings-sealers Reference Chart —Benjamin Foster Company, Division of Amchem Products Inc.

Check 5082 opposite last page.

Ventilator blowers for portable applications are covered in facts available from Coppus Engineering Corp.

Check 5083 opposite last page.

Wire cloth is subject of a fully illustrated 120-page catalog available from The Cambridge Wire Cloth Co.

Check 5084 opposite last page.

Variable-speed drives feature wheels and chains with teeth. Drives have outputs of ½ to 25 hp. They are presented in PIV Drives Cat—Link-Belt Company.

Check 5085 opposite last page.

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— and comments on the significant subjects carried in each month's CHEMICAL PROCESSING are important! We welcome your letters expressing your views. Many CP readers are taking the opportunity to state their views on today's top questions.
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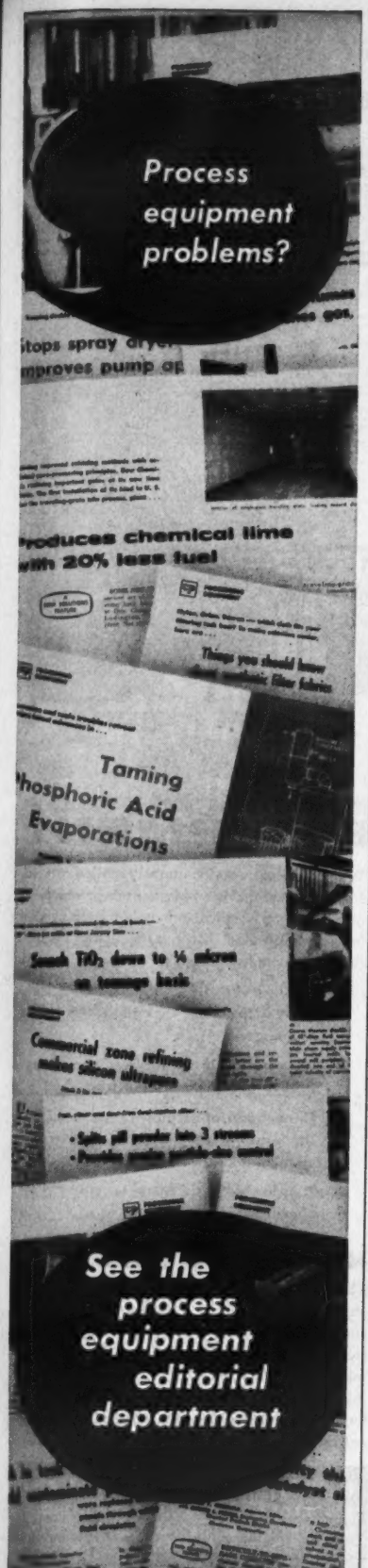

CURRENT LITERATURE

Semi-conductor power-conversion equipment and systems for any AC-to-DC application are indexed in Industrial Rectifier Equipment Guide—The Meaker Company, Subsidiary of Sel-Rex Corporation.

Check 5088 opposite last page.

Perforated screens, made in practically any material desired including plastics, are produced in a variety of patterns suitable for grading, sieving, dewatering, filtering and straining. Descriptions and specifications are outlined in General Cat—The Harrington & King Perforating Co. Inc.

Check 5089 opposite last page.

Manual-impact wrenches are available in sizes of ½ to 1½" square drives, to deliver 250 to 7000 ft-lb of torque. Swench Wrenches—Marquette Division, Curtiss Wright Corporation.

Check 5090 opposite last page.

Waste-hauling compacting truck, mechanically empties waste into 30-cu-yd packer body and compacts material with 85,000-psi force. It is further detailed in Super Dumpmaster Brochure—Dempster Brothers Inc.

Check 5091 opposite last page.

Adhesives for insulation may be obtained for various purposes. They are expanded upon in four-page Adhesives Bul—Benjamin Foster Company, Division of Amchem Products Inc.

Check 5092 opposite last page.

Teflon-products line includes molded and extruded rod and tube, spaghetti tube, dry-film lubricant, skived tape, laboratory ware and special shapes. Chemplast, Inc.

Check 5093 opposite last page.

Extruded Teflon shapes have service-temperature range of −450°F to 500°F.—Pennsylvania Fluorocarbon Co., Inc.

Check 5094 opposite last page.

Steam-turbine/generator units of condensing, automatic-extraction type are taken up in bulletins covering information on types and ratings from 2000-kw to largest. Buls 7654A and 9448—Industries Group, Allis-Chalmers.

Check 5095 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page.

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CURRENT LITERATURE

Spin-top enclosures incorporate recessed control stations and control transformers which can be mounted in collars. They are expanded upon in Bul 9990—Square D Company.

Check 5098 opposite last page.

Pneumatic tool capable of rolling twelve ¼ to 1½" OD tubes every minute and lightweight cleaner with a built-in flushing system are described in information published by—Airetool Manufacturing Company.

Check 5099 opposite last page.

Drives of fixed-speed-gear, fixed-speed-belt, variable-speed-belt, variable-speed-belt and variable-speed-hydraulic types are covered in Bul 1001—Dept. CW-71, Pfaudler Division, Pfaudler Permutit Inc.

Check 5100 opposite last page.

Penton specifications and applications are considered in Penton Facts—Hercules Powder Company Inc.

Check 5101 opposite last page.

Teflon is supplied as rods, sheets, tapes, hose and machined parts with or without bondable surfaces. Information is available from Plastic Products Division, Raybestos-Manhattan, Inc.

Check 5102 opposite last page.

Grating of aluminum with lock-in cross-bar construction is available with serrated or plain models in all sizes. They are covered in Bul A759—Grating Division, Rockwell-Standard Corporation.

Check 5103 opposite last page.

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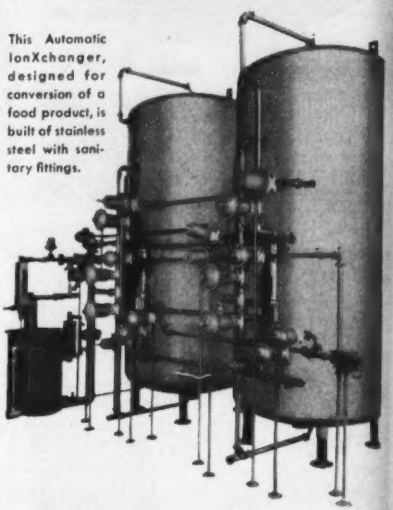

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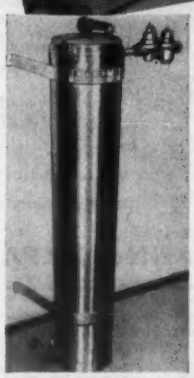

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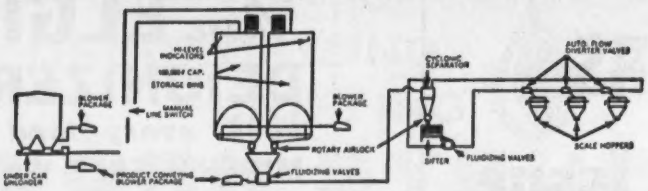

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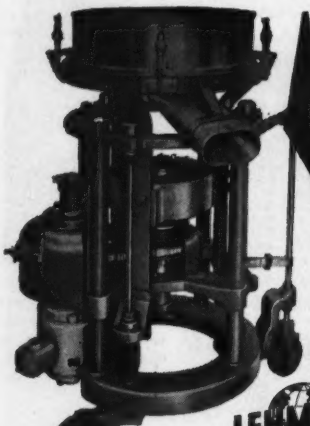

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Gentle Pumping Delivers Emulsions Safely

SHRIVER DIAPHRAGM PUMP

Whether you pump from tank car to storage or from tank to process—you can be SURE of uniform handling of emulsions, without danger of "breaking" or lumping, if you put them through a Shriver Diaphragm Pump.

Experience proves that the Shriver pump provides a safe, gentle, slow speed pumping action that delivers emulsions and other difficult materials at pressures to 100 p.s.i. without violence, shear, rubbing action and gumming, and the consequent need for frequent cleaning.

Bulletin 148 tells why it's safer to use the Shriver Diaphragm Pump on emulsions and other hard-to-handle fluids. Write for a copy.

T. SHRIVER & CO., Inc.

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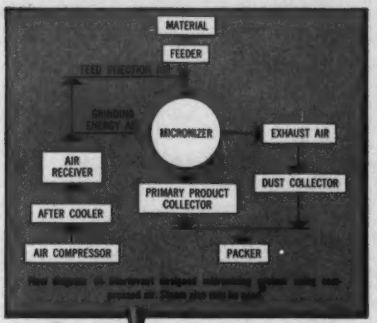
Need ½ to 44 Microns?

Sturtevant Micronizers* Make 325 Mesh Obsolete



One Operation Reduces, Classifies

Sturtevant Micronizers grind and classify in one operation in a single chamber—provide fines in range from ½ to 44 microns to meet today's increased product fineness needs. Can handle heat-sensitive materials.

Production Model (15 in. chamber)

No Attritional Heat

Particles in high speed rotation, propelled by compressed air entering shallow chamber at angles to periphery, grind each other by violent impact. Design gives instant accessibility, easy cleaning. No moving parts.

Classifying is Simultaneous

Centrifugal force keeps oversize material in grinding zone, cyclone action in central section of chamber classifies and collects fines for bagging. Rate of feed and pressure control particle size.

Eight Models Available

Grinding chambers range from 2 in. diameter laboratory size (½ to 1 lb. per hr. capacity) to large 36 in. diameter production size (500 to 4000 lbs. per hr. capacity). For full description, request Bulletin No. 091.

Engineered for Special Needs

A 30 in. Sturtevant Micronizer is reducing titanium dioxide to under 1 micron at feed rate of 2250 lbs. per hr. For another firm, a 24 in. model grinds 50% DDT to 3.5 average microns at a solid feed rate of 1200-1400 lbs. per hr. A pharmaceutical house uses an 8 in. model to produce procaine-penicillin fines in the 5 to 20 micron range. Iron oxide pigment is being reduced by a 30 in. Micronizer to 2 to 3 average microns.

Sturtevant will help you plan a Fluid-Jet system for your ultra-fine grinding and classifying requirements. Write today.

Can Test or Contract Micronizing Help You?

Test micronizing of your own material, or production micronizing on contract basis, are part of Sturtevant service. See for yourself the improvement ultra-fine grinding can contribute to your product. Write for full details. STURTEVANT MILL CO., 118 Clayton St., Boston, Mass.

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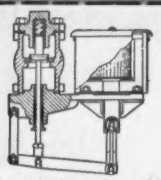
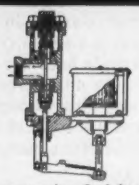
BIG LINE-UP
BIG PERFORMANCE

Johnson Solenoid Valves are built for heavy duty service . . . handling, air, water, steam, heavy viscous liquids. No pilots or pistons; powerful leverage design opens smaller valves against 250 lbs. Because of the remoteness of the solenoid, temperatures up to 400° F. are easily handled without adverse effect on the solenoid coil. Bodies are bolted together. Explosion-proof models also.

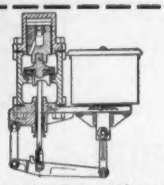
JOHNSON
Direct Operated
SOLENOID VALVES



Normally closed service, stainless steel valve and seat. Sizes ⅜"-3". Also for normally open service, and with Jenkins Disc.



3-way valve. Stainless steel valves and seats. Sizes ½"-1½".



Dashpot construction, cushions closing to avoid water hammer. Jenkins Disc. Sizes ¾"-2".

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THE JOHNSON CORPORATION
826 Wood St., Three Rivers, Mich.

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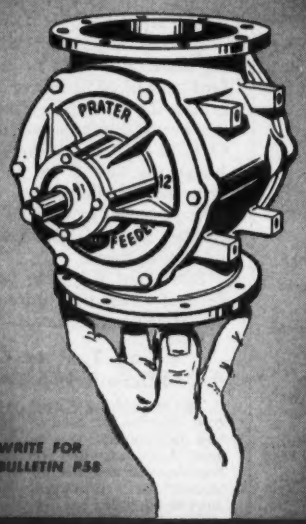
the recognized leader



WRITE FOR BULLETIN P58

PRATER PULVERIZER COMPANY
1513 S. 55th Court Chicago 50, Illinois
Foremost Builder of Rotary Airlocks

Check 5111 opposite last page.

that's interesting

Out-of-world home welded with 'wonder' adhesives

"Chemically welded" from roof to base pad is the "Chemosphere," an octagonal-shaped home mounted atop a 30′ concrete column in the Hollywood Hills of southern California.

Plastic and Chemical compounds, formulated from polysulfide liquid polymers and epoxy resins, were used to put the aluminum-sided dwelling together.

Leonard J. Malin, electronics engineer, built the home himself. It was designed by Architect John Lautner. Chem Seal Corporation sponsored the job.

The 2200-sq-ft house contains living room, dining room, kitchen, bar, four bedrooms, two baths, laundry and sewing rooms. It is reached by four-passenger electric cable car. It cost in excess of $100,000.

Plane landing smoother than ride in van

If a taped record made by the Radio Corporation of America is any criteria, a normal airplane landing is four times as smooth as a ride on city streets.

When an RCA 501 computer was shipped recently from Camden, N.J., to Stockholm, Sweden, a tape recorder was strapped to the console. A stylus inside the instrument recorded all the "ups and downs" and horizontal motions that the equipment experienced from start to finish.

During the firt and last legs of the trip, made by truck, the

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865 11th Street Marion, Iowa

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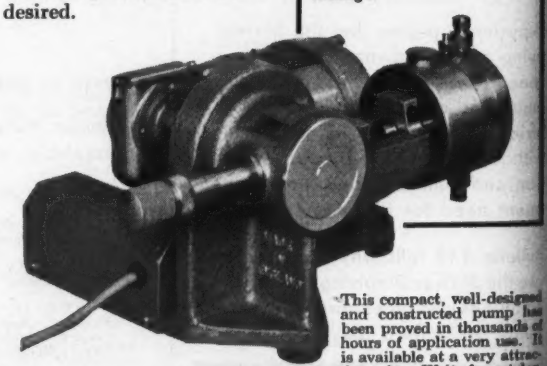
MICROMETER ACCURACY

The Marton Micro Pump is a highly accurate metering pump for use where a small, constant pre-set flow is required . . . or where the flow has to be varied at will. A micrometer adjustment selects the precise rate of flow desired.

ACCURACY to within 0.1%
CAPACITY from 0-7 ccs/hr. up to 0-1,500 ccs/hr. Also 0-750 ml/hr. to 0-37,300 ml/hr. Rate can be varied while in operation.
PRESSURES up to 200 psig.
SAFE — will handle virtually any liquid without danger of leakage.



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Representatives: some territories available.

MARTON EQUIPMENT, INC. 200 Rantoul Street Beverly, Massachusetts

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☐ 4756	☐ 4782	☐ 4807	☐ 4832	☐ 4857	☐ 4882	☐ 4907	☐ 4932
☐ 4757	☐ 4783	☐ 4808	☐ 4833	☐ 4858	☐ 4883	☐ 4908	☐ 4933
☐ 4758	☐ 4784	☐ 4809	☐ 4834	☐ 4859	☐ 4884	☐ 4909	☐ 4934
☐ 4759	☐ 4785	☐ 4810	☐ 4835	☐ 4860	☐ 4885	☐ 4910	☐ 4935
☐ 4760	☐ 4786	☐ 4811	☐ 4836	☐ 4861	☐ 4886	☐ 4911	☐ 4936
☐ 4761	☐ 4787	☐ 4812	☐ 4837*	☐ 4862	☐ 4887	☐ 4912	☐ 4937
☐ 4762	☐ 4788	☐ 4813	☐ 4838	☐ 4863	☐ 4888	☐ 4913	☐ 4938
☐ 4763	☐ 4789	☐ 4814	☐ 4839	☐ 4864	☐ 4889	☐ 4914	☐ 4939
☐ 4764	☐ 4790	☐ 4815	☐ 4840	☐ 4865	☐ 4890	☐ 4915	☐ 4940*
☐ 4765	☐ 4791	☐ 4816	☐ 4841	☐ 4866	☐ 4891	☐ 4916	☐ 4941
☐ 4766	☐ 4792	☐ 4817	☐ 4842	☐ 4867	☐ 4892*	☐ 4917	☐ 4942
☐ 4767	☐ 4793	☐ 4818	☐ 4843	☐ 4868	☐ 4893	☐ 4918	☐ 4943*
☐ 4768	☐ 4794	☐ 4819	☐ 4844*	☐ 4869	☐ 4894	☐ 4919	☐ 4944
☐ 4769*							

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*ON ALL NUMBERS HAVING AN ASTERISK (*) after them, please identify the exact product or piece of literature in one of the blank columns on this and the next page. Write in the key number, as given on the slip, followed by the bulletin number (or title), or name of product in which you are interested.

See additional numbers on reverse side ▷

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Continued from reverse side of this sheet

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(This request form expires October 5, 1961)

Use this space for writing in specific literature or product designation when you check a number with an asterisk (*) in accompanying list. Repeat the key number from that list, and follow it with specific bulletin number (or title), or product name, as it appears in article or advertisement. PLEASE TYPE OR PRINT.

Key No.	Description

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☐ 4945	☐ 4967	☐ 4989	☐ 5011*	☐ 5033	☐ 5055	☐ 5077	☐ 5099
☐ 4946	☐ 4968	☐ 4990	☐ 5012	☐ 5034	☐ 5056	☐ 5078	☐ 5100
☐ 4947	☐ 4969	☐ 4991	☐ 5013	☐ 5035	☐ 5057	☐ 5079	☐ 5101
☐ 4948	☐ 4970	☐ 4992	☐ 5014*	☐ 5036*	☐ 5058	☐ 5080	☐ 5102
☐ 4949	☐ 4971	☐ 4993	☐ 5015	☐ 5037	☐ 5059	☐ 5081	☐ 5103
☐ 4950	☐ 4972	☐ 4994	☐ 5016	☐ 5038	☐ 5060*	☐ 5082	☐ 5104
☐ 4951*	☐ 4973	☐ 4995	☐ 5017	☐ 5039	☐ 5061	☐ 5083	☐ 5105*
☐ 4952	☐ 4974	☐ 4996	☐ 5018	☐ 5040*	☐ 5062	☐ 5084	☐ 5106
☐ 4953	☐ 4975	☐ 4997	☐ 5019	☐ 5041	☐ 5063	☐ 5085	☐ 5107
☐ 4954	☐ 4976	☐ 4998	☐ 5020	☐ 5042	☐ 5064	☐ 5086*	☐ 5108
☐ 4955	☐ 4977	☐ 4999	☐ 5021	☐ 5043	☐ 5065	☐ 5087	☐ 5109
☐ 4956	☐ 4978	☐ 5000	☐ 5022	☐ 5044	☐ 5066	☐ 5088	☐ 5110
☐ 4957	☐ 4979	☐ 5001	☐ 5023	☐ 5045	☐ 5067	☐ 5089	☐ 5111
☐ 4958	☐ 4980	☐ 5002	☐ 5024	☐ 5046	☐ 5068	☐ 5090	☐ 5112
☐ 4959	☐ 4981	☐ 5003	☐ 5025	☐ 5047*	☐ 5069	☐ 5091	☐ 5113
☐ 4960	☐ 4982	☐ 5004	☐ 5026	☐ 5048	☐ 5070	☐ 5092	☐ 5114
☐ 4961	☐ 4983	☐ 5005	☐ 5027*	☐ 5049	☐ 5071	☐ 5093	☐ 5115
☐ 4962	☐ 4984	☐ 5006	☐ 5028	☐ 5050	☐ 5072	☐ 5094	☐ 5116
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☐ 4964	☐ 4986	☐ 5008	☐ 5030	☐ 5052	☐ 5074	☐ 5096	
☐ 4965	☐ 4987	☐ 5009	☐ 5031	☐ 5053	☐ 5075	☐ 5097	
☐ 4966*	☐ 4988*	☐ 5010	☐ 5032	☐ 5054	☐ 5076	☐ 5098	

Please type or print and be sure to give your title and main product of company

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Company ..... Main Product .....

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City ..... Zone No. ..... State .....

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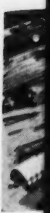

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equipment was subjected at intrevals to a jostle in excess of 2 "g's". (A "g" is roughly the pressure of an object's own weight upon itself.) During each of the two plane landings, at Keflavik, Iceland, and Bromma Airport in Sweden, the tape showed only ½ "g".

Dome launches new era in industrial architecture

Big enough to house a football field or baseball park is all-steel dome constructed at Wood River, Ill., to house Union Tank Car Companies' regional tank car repair plant.

Built from top down, being raised pneumatically by huge air-inflated nylon bag as construction progressed, dome is made of 893 hexagonal steel panels welded together and strengthened by network of steel pipes. It has 380′ diam and is 120′ high.

Solvent cleans motor while it's running

Model railroaders and other hobbyists, who work with small difficult-to-clean pieces, will be interested in a nontoxic, nonflammable, selective solvent, a blend of two Freon solvents.

This cleaning agent removes grease and dirt without affecting plastics, metals, electrical insulation, paints or varnishes. Since it is electrically nonconductive, it is possible to clean electric engines by immersing them in the fluid while running.

Trade-named En-Irt, it is produced by Kyle Products Co., 2207 Old Orchard Rd., Wilmington 3, Del. Du Pont supplies the Freon solvent mixture.

The new, Appleton "CES-CESD" type receptacle Unilet and matching plug is feature-packed to give you outstanding performance for all industrial equipment requiring heavy-duty circuit breaking outlets *without* disconnect switches ahead of the outlet.

You will particularly like the installation simplicity—the push-pull operating ease and these Appleton convenience features . . .

Advanced, compact design • Interchangeability of plug or receptacle with certain other brands • pressure-type solderless receptacle connectors • exclusive plug-locking slide mechanism • smooth surfaces, chamfered edges • concealed cable clamp • choice of 30-ampere, ¾" hub or 60-ampere, 1¼" hub in CES or CESD types • and the quality construction that meets most installation requirements; CES for Class I, Groups C and D—CESD for Class I, Group D.

Wherever hazardous area installations *or replacements* are made, you can depend upon this latest Appleton development to give you safe, foolproof protection. Write today for full details—bulletin No. CES 660.

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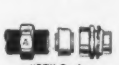
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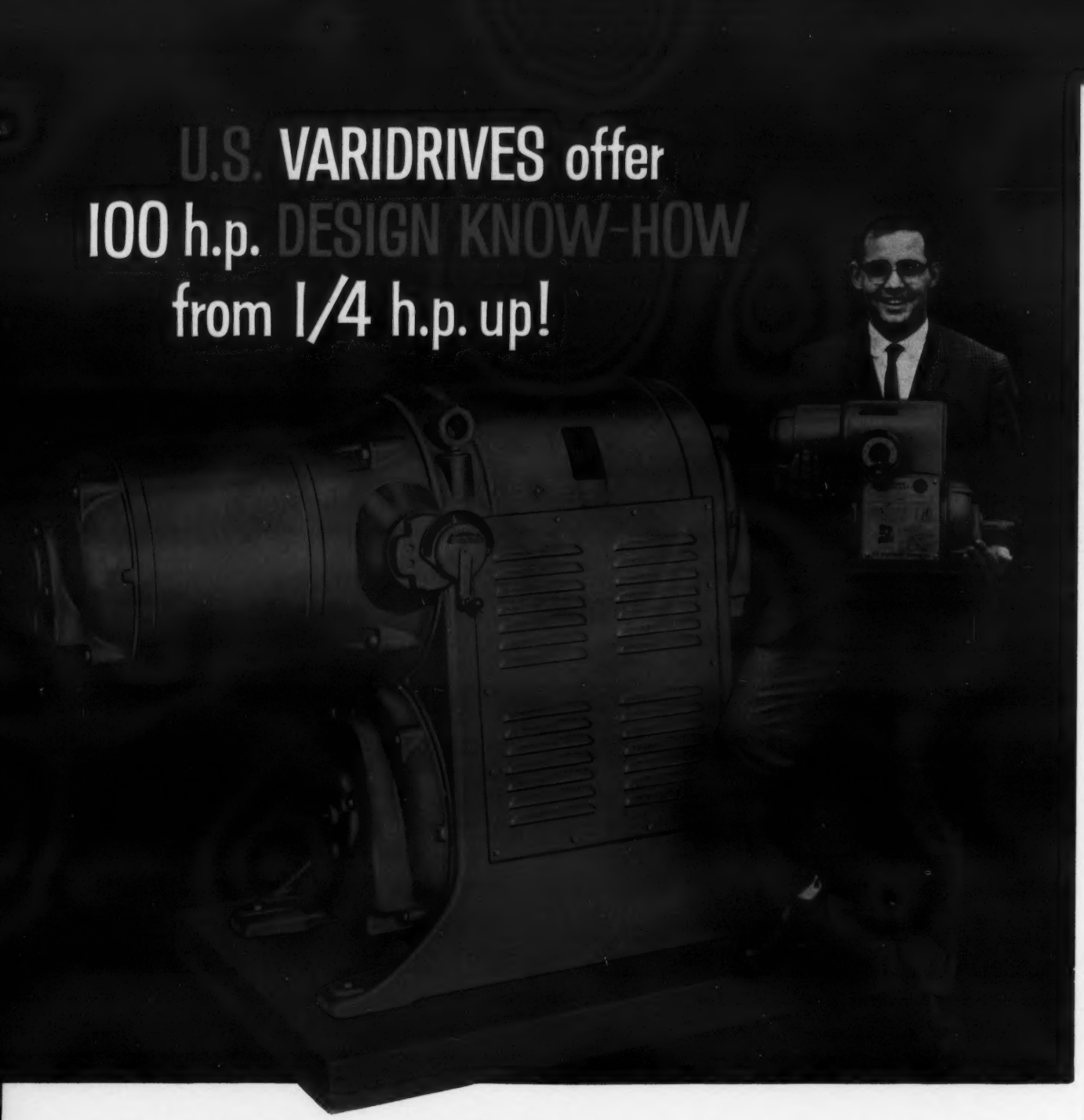

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